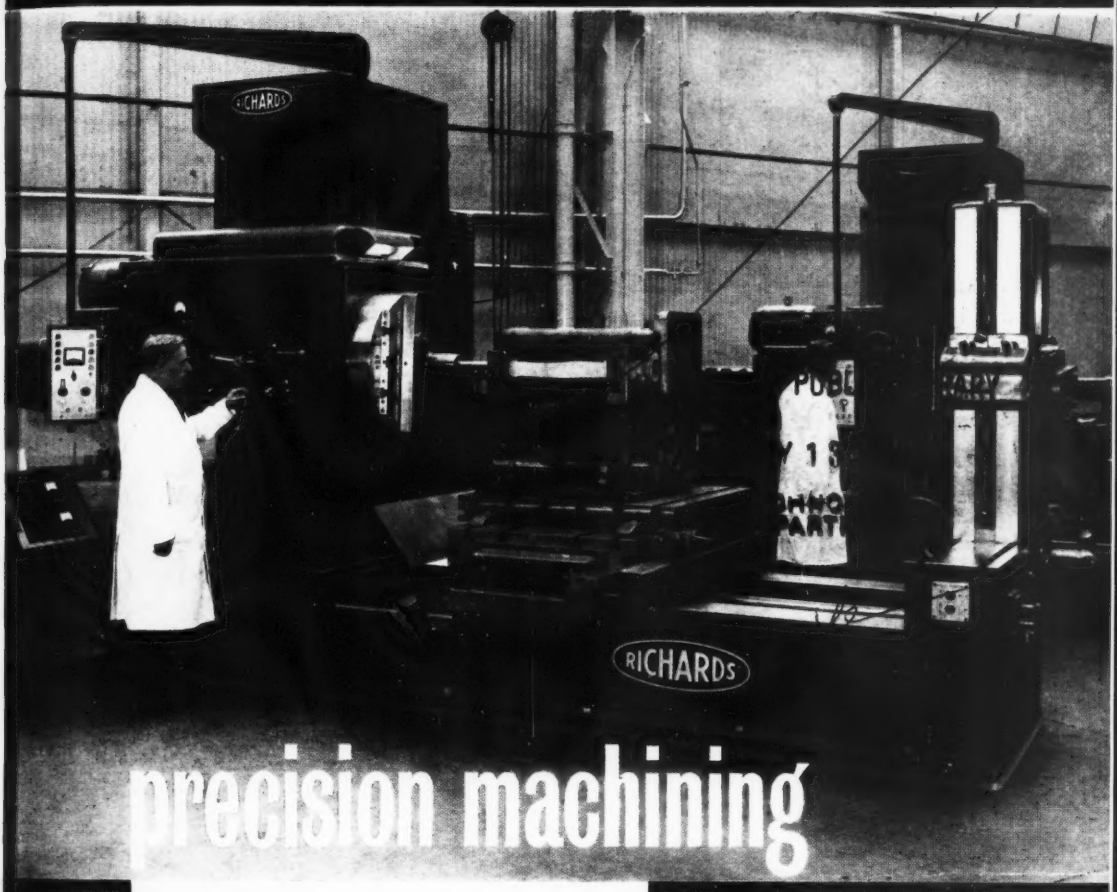
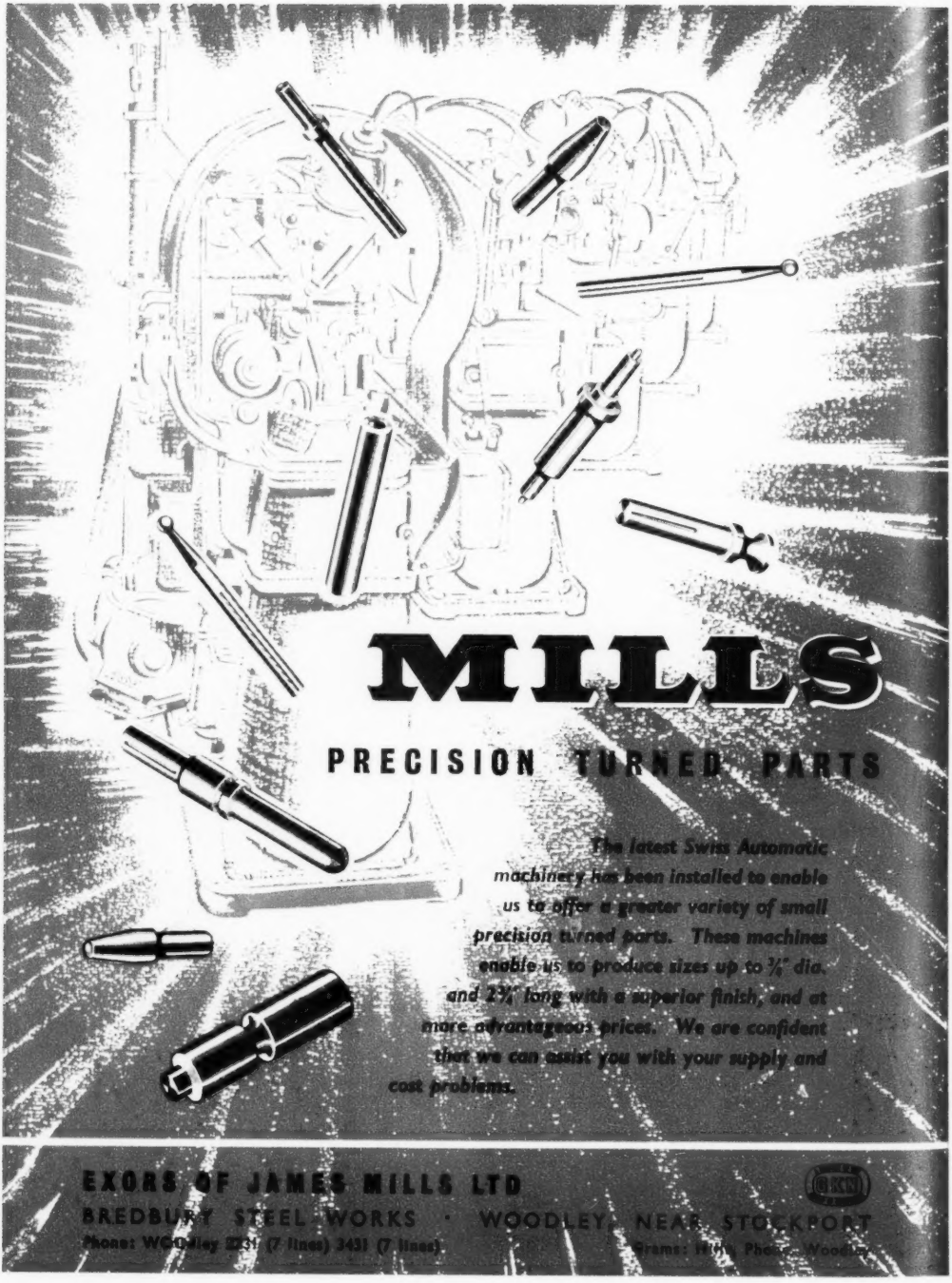
MACHINERY

APRIL 26, 1961 — ONE SHILLING & THREEPENCE



precision machining


MILLS
PRECISION TURNED PARTS
The latest Swiss Automatic machinery has been installed to enable us to offer a greater variety of small precision turned parts. These machines enable us to produce sizes up to ¾" dia. and 2¾" long with a superior finish, and at more advantageous prices. We are confident that we can assist you with your supply and cost problems.
EXORS OF JAMES MILLS LTD
BREDBURY STEEL WORKS · WOODLEY · NEAR STOCKPORT
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Grams: Hydra, Phone, Woodley
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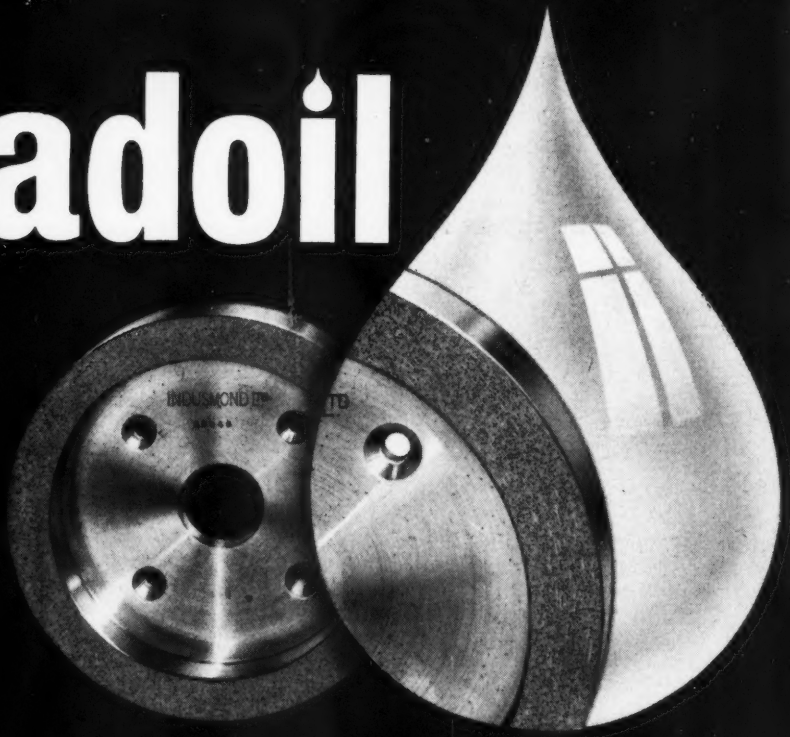
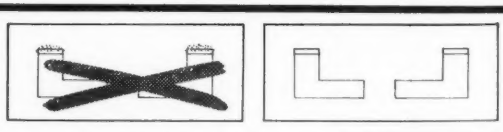
Stadoil



doubles the life of diamond wheels

Stadoil has been specially developed to give your diamond wheels, laps and grinders longer life and greater efficiency by removing the load and glaze whilst you are actually grinding.

Make no mistake, every time you dress a wheel you probably remove enough impregnated diamond to grind an extra fifty tools! Stadoil gives you the complete answer! You save time; your wheels last longer; and this cleaner operation gives you fine finishes too!



Try it NOW! Send for special free trial offer today! The easiest way to test is to try it.

Write or telephone Stadoil Sales Division, Indusmond Diamond Tools Ltd., 26-29 St. Cross Street, London, E.C.1. Tel: Chancery 7608

indusmond
DIAMOND TOOLS

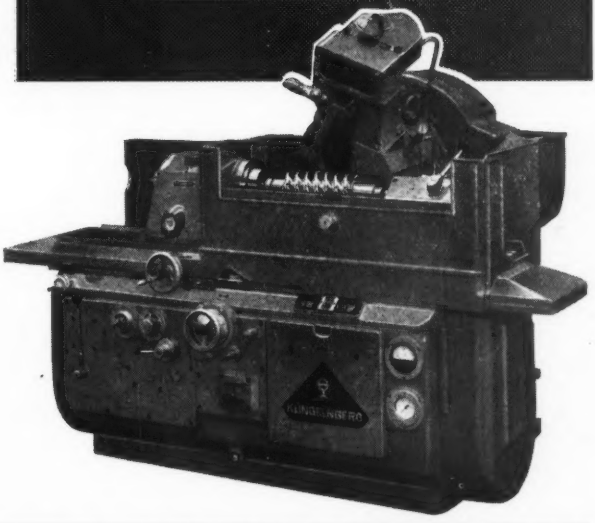
Indusmond is one of a group of companies who have worked with diamonds since 1870. Indusmond have been making diamond tools for 21 years, these include single point, multi point, indexing and impregnated wheel dressing diamond tools, turning, three forming, hardness testing and special purpose diamond tools, diamond impregnated wheels, laps and grinders.

INDUSMOND (DIAMOND TOOLS) LIMITED, 26-29 ST. CROSS STREET, LONDON, E.C.1.

MODEL HSS 33 B

Automatic
Worm Grinding Machine enables you to obtain the increased efficiency, longer life and higher load capacity which result from the use of hardened and precision ground worms.
Single or multi-start worms, in a wide range of size and pitch can be economically produced to an exceptionally high standard of accuracy and finish.
The redesigned wheel dresser employs a single sided template to profile both sides of the wheel simultaneously with mirror-image accuracy.
Extreme flexibility in operation is an important feature of Model HSS 33 B; the workpiece can be machined during both forward and reverse strokes and the two flanks may be ground simultaneously or individually.

KLINGELNBERG
REMSCHEID



BRIEF SPECIFICATION

Workpiece diameter	From ¼ in. to 12½ in.
Pitch range	1 to 50 D.P.
Number of starts	1 to 10
Max. Lead angle	40°
Lead range (4 T.P.I. Leadscrew)	¼ in. to 10 in.
Lead range (2 T.P.I. Leadscrew)	½ in. 20 in.
Max. Length:	
Worms between centres	28½ in.
Shaft worms (up to 3½ in. shank diameter)	43½ in.
Max. Length ground:	
up to 30° lead angle	17½ in.
up to 40° lead angle	16½ in.

The capacities given above for Lead and number of starts can, in certain cases, be increased.

Fully detailed information available on request.

SOLE BRITISH AGENTS

SYKES MACHINE TOOL COMPANY LIMITED

Hythe Works, The Hythe, Staines, Middlesex. *Telephone:* Staines 55471 (5 lines) *Telegrams:* Sytool Staines

NOW-Really *FAST* Pressing

on the NEW 5, 10 and 15 ton

RG HIGH SPEED HYDRAULIC PRESSES

Built solely for 'D & D' by Rhodes, Gill & Co. Ltd., specialists in high pressure hydraulics. Entire mechanism enclosed within sturdy fabricated steel frame. High ram speeds plus positive power return. Working pressure and slow advance for setting easily controlled. Pressure gauge and isolating valve provided. Compactly housed ram guides cannot foul pillars of die sets. Perspex guards available providing unobstructed view of entire table.

5 ton bench and pedestal models. 10 and 15 ton models available with stroke limiting device (provides extremely accurate "inching"), T-slotted tables and automatic rotary indexing table.

	5 TON	10 TON	15 TON
STROKE	4"	8"	10"
TABLE SIZE	14" x 11½"	16" x 14"	18" x 16"

SEE THE 5 AND 10 TON MODELS AT OUR SHOWROOMS

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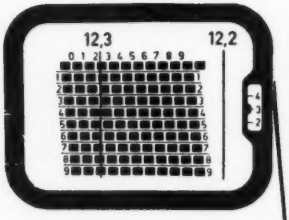
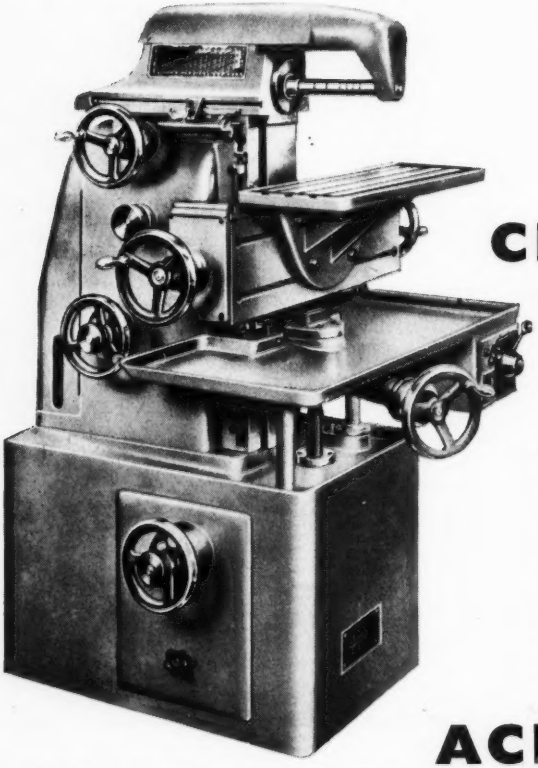
TWO SWISS PRECISION MACHINES

PERRIN
MODEL AV2
JIG BORER
WITH OPTICAL TABLE
Automatic Positioning Available

Boring capacity in cast iron 4in.
Table size 19⅝in. × 11in.
Longitudinal movement 16in.
Transverse movement 11in.
Max. distance spindle to table 18½in.
Infinitely variable spindle speeds from 60-3200 r.p.m. with power feed to spindle.



Two scales as shown controlling longitudinal and transverse settings



CHRISTEN UO-A
UNIVERSAL MILLING MACHINE
with Table swivelling in 3 planes
FOR HORIZONTAL & VERTICAL MILLING

Especially suitable for toolmaking and for high precision repetition work.

Infinitely variable speeds and feeds.

Longitudinal and vertical power feed to table.

Table size 26¾in. × 9in.

Large range of attachments available including vertical milling head, slotting attachment, universal dividing head, rack milling attachment, measuring equipment with slip gauges and dial indicators.

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Telephone: CENtral 6811/2 — 2287/8/9

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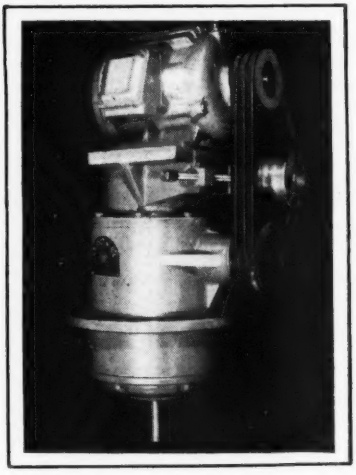
Dress in "Crimplene" made from 100% Terylene. By Courtesy of I.C.I. Limited.

Sanderson's Heliocentric Speed Reducing Gears help "Terylene" production

Sanderson's Heliocentric Speed Reducing Gears have been chosen by Imperial Chemical Industries Limited to play an important part in the production of 'Terylene' polyester fibre. Gears are installed in I.C.I. plants producing 'Terylene' in Great Britain, and in the many plants manufacturing polyester fibre under licence throughout the world.

Heliocentric may be the answer to your power transmission problems—range of ratios 20:1 to 512,000:1. Horse power 1/6 to 30.

Please write for illustrated brochure to Department H.G.



Motorised Heliocentric Speed Reducer, ratio 280:1 designed for synthetic fibre extrusion plant

SANDERSON BROTHERS AND NEWBOULD LIMITED

Attercliffe Steelworks, P.O. Box 6, Newhall Road, Sheffield 9

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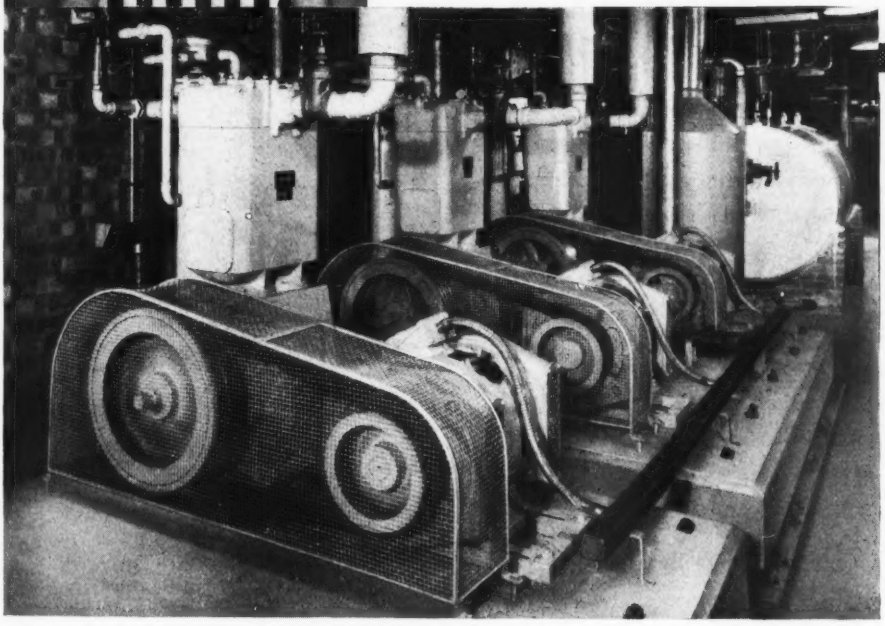
Kodak keep "BROOMWADE" in the picture



Three "BROOMWADE" Type C660 Oil-free Air Compressors installed at the Kodak factory.

Photograph by courtesy of Messrs. Kodak Limited.

In KODAK'S modern factory at Harrow three "BROOMWADE" Type C660 Dry Cylinder, Carbon Ring Air Compressors maintain a continuous supply of OIL-FREE air for instrument control during the various manufacturing processes.

Oil-free compressed air is essential for the accurate instrumentation demanded in the production of top-quality photographic materials. The controlling instruments must maintain an exceptionally high standard of accuracy, and — just as important — they must be completely reliable in order to give uninterrupted service throughout the long runs that are encountered.

Messrs. Kodak Limited rely upon "BROOMWADE" Oil-free Air Compressors for such vital duties. They have proved by long experience that "BROOMWADE" compressors are a reliable source of compressed air, and that the supply is always absolutely free from oil.

Larger capacity Air Compressors delivering OIL-FREE AIR available.

Write for full details.

"BROOMWADE"

AIR COMPRESSORS & PNEUMATIC TOOLS · YOUR BEST INVESTMENT

BROOM & WADE LTD., P.O. BOX No. 7, HIGH WYCOMBE, ENGLAND

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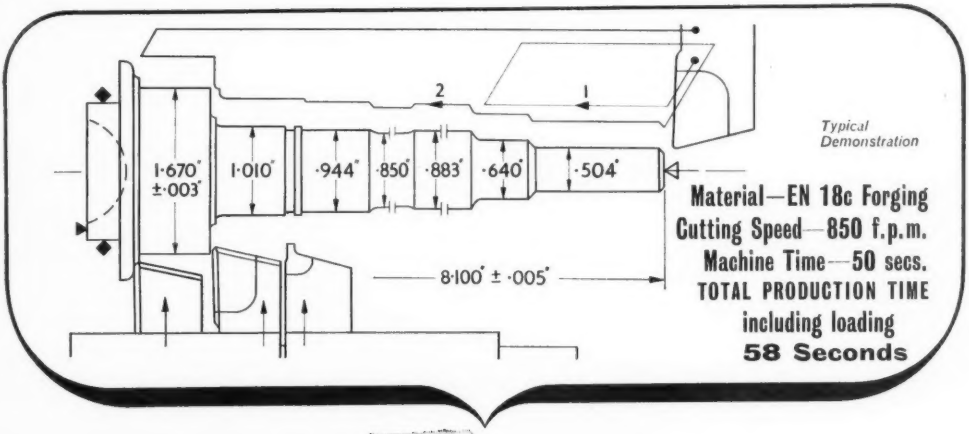
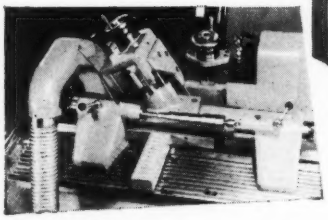
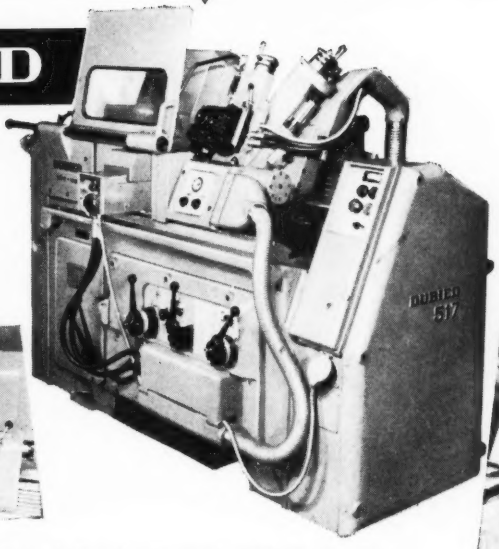


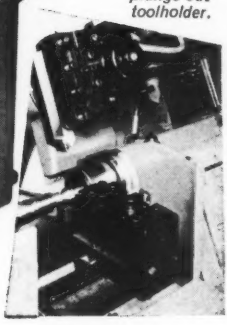
DUBIED

HYDRAULIC COPYING LATHE 517



Automatic feed-change trips.





Auxillary plunge cut toolholder.

This Swiss-built automatic copying lathe is of unit construction and available in several forms according to need.

The 517 r 6 illustrated incorporates automatic change of motor speed, automatic 6-cycle attachment, automatic feed change, hydraulic plunge cutting attachment, hydraulic clamping and tailstock operation, and automatic indexing toolholder to copying slide.

The tool path can be pre-set for a number of roughing cuts, after which the toolholder in the copying slide automatically indexes to bring the finishing tool into position for the full copying sequence, or for selected diameters, hydraulically controlled from the template follower.

The plunge cutting toolholder mounted on the front slide advances to produce shoulders and undercuts as required.
Work loading is facilitated by hydraulic clamping and tailstock operation, after which the machining cycle is entirely automatic.

Distance between centres	20 inches
Swing	9½ inches
Max. turning diameter	4¾ inches
Spindle speed	from 350 to 4,000 r.p.m.

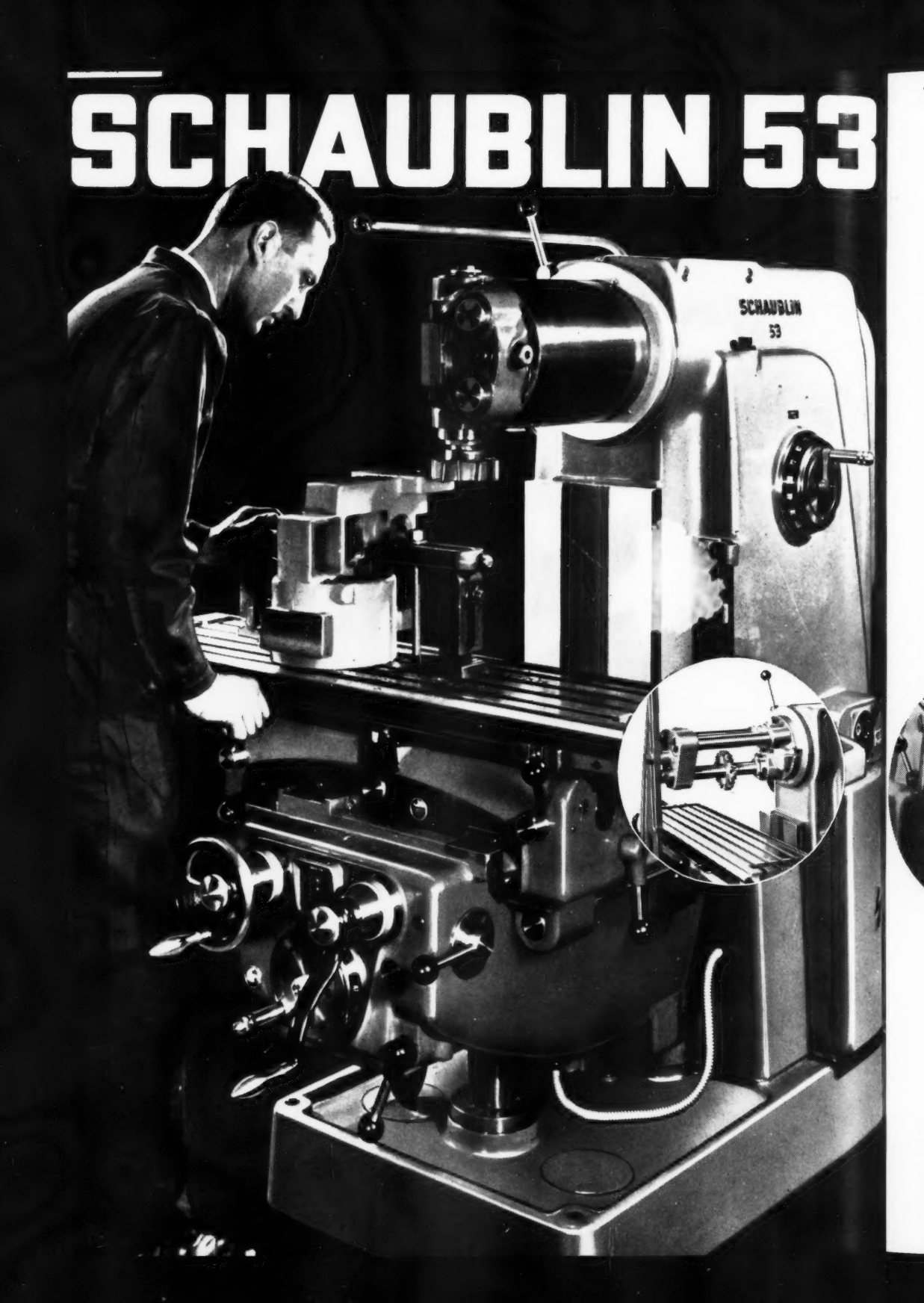
A demonstration of this versatile machine will be gladly arranged on request.

WICKMAN LIMITED

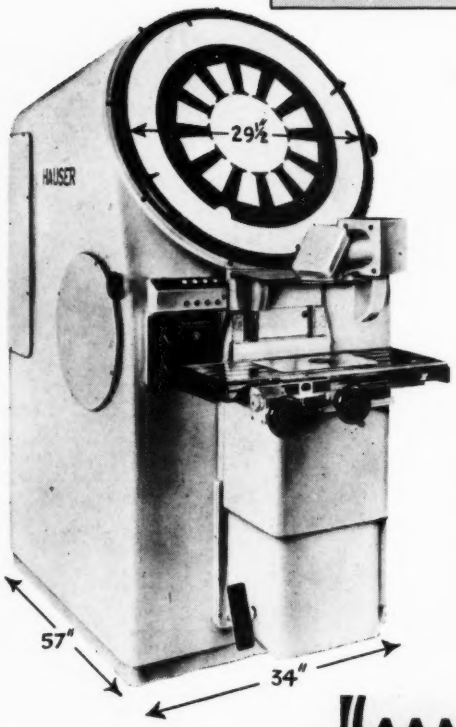
FACTORED MACHINE TOOL DIVISION, BANNER LANE, COVENTRY. Tel. Tile Hill 65231

571 F60

SCHAUBLIN 53



HAUSER



When precision is important — but space is at a premium, the

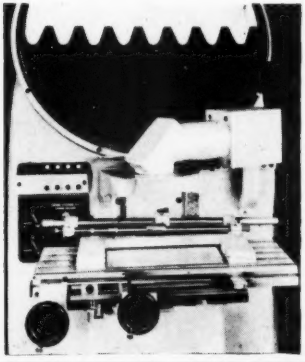
The P.750 PROFILE PROJECTOR

provides the answer

This recent addition to the Hauser range incorporates big-screen projection in compact form. Designed around a vertically arranged optical system it enables many types of specimens to be applied without holding fixtures. Four degrees of magnification are provided, 10X, 20X, 50X and 100X with episcopic or diascopic projection, magnification and work-table height being selected by push-buttons. Table clearance permits the inspection of bulky workpieces. The large projection screen is calibrated with angular readings on vernier of one minute of arc for angle measurement.

Specification:

Work table area	25⅝ in. x 8⅞ in.
Longitudinal travel (adjustment by micrometer screw, dividing drum and gauge blocks,	8 in.
Transverse travel	3½ in.
Clearance, table to condenser	12 in.
Vertical travel of table	6 in.



The range of accessories includes: combination tail stocks and vee blocks for holding turned parts; tiltable support with centres for inspection of threads; and a gear checking device for the examination of small gear tooth meshing.

Sole Agents:

WICKMAN LIMITED

FACTORED MACHINE TOOL DIVISION

Banner Lane, Coventry. Tel. Tile Hill 65231

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MECHANICAL LUBRICATION —THE BLOOD-STREAM OF A MACHINE

Tecalemit Mechanical Lubrication Systems save power, lubricant and labour, and greatly increase the working life of your machines. They are infinitely flexible, and can be fitted into new designs or existing machinery.

With Tecalemit Mechanical Lubrication, bearings need no longer be accessible to hand oiling, and there will be no forgotten, neglected or under-oiled bearings to cause costly breakdowns and production hold-ups. Nor is there any danger of messy excess lubricant spoiling products. Tecalemit Mechanical Lubrication Systems provide accurately regulated lubrication to each individual bearing, at the correct intervals.

The BRENTFORD is a fully automatic multiline oiling system, with from one to twenty lines, each with its own independently regulated pump. The unit takes its power from the rotary or reciprocating motion of the machine it serves, or can be supplied with its own electric motor.

The BIJUR is a single-line system, with one central pump supplying up to 100 points. Each outlet is equipped with a metering valve which gives a pre-determined regulated supply of oil to each bearing.

Tecalemit Mechanical Lubrication can solve your problems and speed your production.

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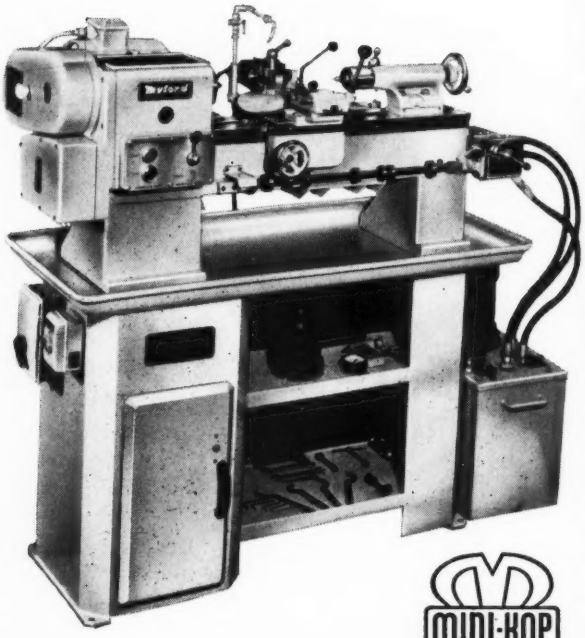
T.714

a high-speed hydraulic copying lathe for small parts

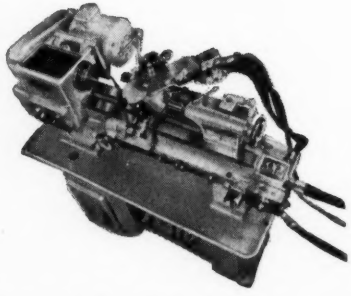


MINI-KOP

Myford MINI-KOP

SERIES 1A

Specifically designed for copy-turning small components up to 1 inch diameter. This is a **fully** hydraulic machine with hardened bed . . . hydraulic carriage motion has instantly variable feed-rate control and fast traverse in either direction . . . alternative reproducer approach angles . . . and many other features to facilitate small component copying.



Automatic length stops accurate within 0.001 inch.
Will reproduce steps as small as 0.0005 inch.
Will reproduce profiles within 0.001 inch on the diameter.
Will repeat diameters well within 0.001 inch.
Spindle speeds to over 4,000 r.p.m.
Costs little more than many copying attachments.

See this machine at Stand No. 37, at the Engineering, Marine Welding and Nuclear Energy Exhibition, Inner Row Gallery, Grand Hall, Olympia.

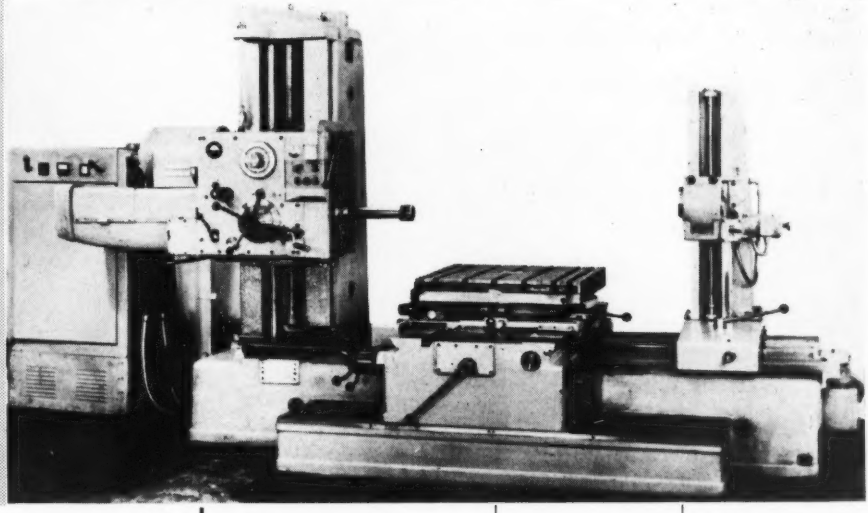
Please write for further information to

MYFORD MACHINE TOOLS

Myford Ltd BEESTON NOTTINGHAM TEL: NOTTINGHAM 254222

The New Range PLAUERT TOOL ROOM

SERIES WH HORIZONTAL BORING & MILLING MACHINES



MODEL WH 63 WITH UNIVERSAL HOIST

Rigid construction of the bed supporting the saddle. • Pre-selection of speeds and feeds. Wide range of spindle speeds and power feeds. Changing of all feed directions of the spindle, and headstock as well as of the longitudinal, cross and rotary movements of the table by a **single lever** for feeds and movements. **Locking** of the headstock as well as of the longitudinal, cross and rotary movements of the table by a **single lever** for locking headstock and table in all movements. • Accurate indexing of the table dial indicator. Optical measuring equipment for co-ordinate setting of the headstock and table.

MODEL			WH 63		WH 80	
Diameter of work spindle		mm.	63	$2\frac{16}{32}$"	80	$3\frac{5}{32}$"
Taper in spindle		Morse	4		5	
Travel of work spindle		mm.	560	22"	710	28"
Spindle speed range—21 steps		r.p.m.	18—1800		14—1400	
Working surface of table		mm.	800×890	$31\frac{1}{4}$×35"	1000×1090	$39\frac{3}{8}$×43"
Rotary feeds at 1000 mm. ($39\frac{3}{8}$") table diameter—26 steps		mm./rev.	0·056—18	0·002"—0·7"	0·07022—5	0·0027"—0·9"
Longitudinal and cross rapid traverse		mm./min.	1600	63" per min.	1600	63" per min.
Main drive motor:	output	kW	5·5		7·5	
	speed	r.p.m.	1425		1440	
Feed motor:	output	kW	1·6		1·6	
	speed	r.p.m.	2800		2800	

Selson MACHINE TOOLS

The Selson Machine Tool Co. Ltd

SUNBEAM ROAD, LONDON, N.W.10. Telephone Elgar 4000

STANNINGLEY, Near LEEDS Telephone Pudsey 2241

And at Kingsbury (Nr. Tamworth), Manchester, Glasgow, Swansea, Newcastle-on-Tyne, Sheffield, Southampton, Belfast, Bath.

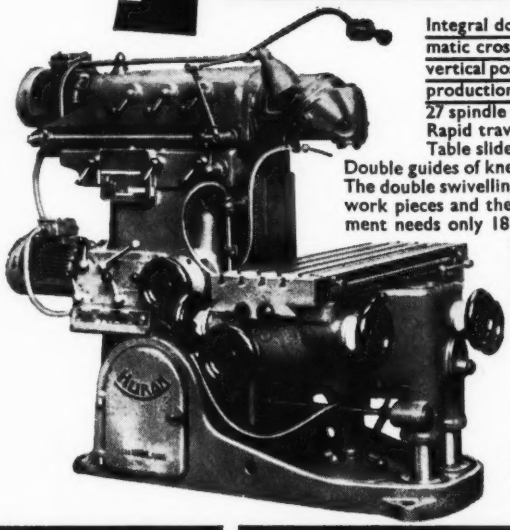
600 GROUP

SLIDING RAM GIVES 27½in. AUTO CROSS FEED

HEAVY DUTY MILLING

ANGULAR COMPOUND HORIZONTAL VERTICAL

HURON SUPER UNIVERSAL MILLERS



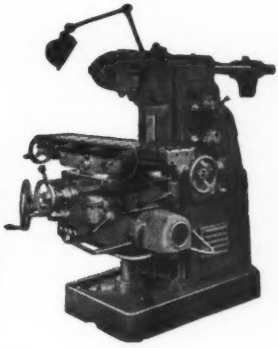
Integral double swivelling universal head provided with 27½in. automatic cross feed by the sliding ram, can be set to the horizontal or vertical position, or to any angle instantaneously—permits the heaviest production cuts. Head can be retracted completely from table line. 27 spindle speeds from 30 to 2,066 r.p.m., 27 feeds from $\frac{1}{16}$in. to 30in. Rapid traverses in all directions. All operating controls duplicated. Table slides directly in the knee without cross movement or swivel. Double guides of knee permit components in excess of 1½ tons to be machined. The double swivelling universal head requires an opening of only 14in. to enter work pieces and the whole sliding ram with its 27½in. automatic cross movement needs only 18in. clearance. OPTIONAL EXTRA FEATURES: Mounted spacing casting assemblies providing additional 8in. capacity under spindle. 26in. wide 8 T-slot tables and 39⅜in. automatic cross feed of sliding ram with special heavy duty knee and front operating position.

Type	Table	Automatic Feeds Long	Cross	Vert.
KU4	56⅜in. × 15¾in.	43¾in.	27½in.	19⅝in.
KU5	64⅛in. × 15¾in.	51⅛in.	27½in.	19⅝in.
KU6	78⅛in. × 16½in.	59in.	27½in.	19⅝in.
KU55	64⅛in. × 26in.	51⅛in.	39⅜in.	18⅛in.
L83	157in. × 59in.	118in.	39⅜in.	59in.

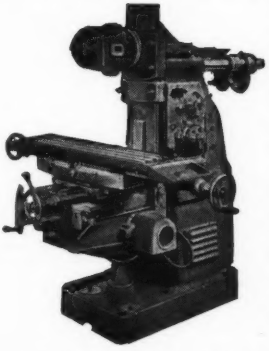
Type 'L' Open-side Traversing Head Universal Miller will mill, bore, slot and drill the largest work-pieces at one setting. The unique design permits greatest variety of operation on large work-pieces; the component remains stationary on the large work-table. Upright slides full length of base table and the sliding ram moves vertically and horizontally.

DUFOUR UNIVERSAL MILLERS

WITH DOUBLE UNIVERSAL SWIVELLING HEAD, RETRACTABLE SLIDE BRACKET AND SPACING CASTING GIVING 26" DAYLIGHT ON No. 59 AND 21" ON No. 61



FOR ALL MODELS Direct reading dial change for speeds and feeds. All parts subject to wear hardened and ground and completely interchangeable. Built to closest tolerances. Rapid traverses in all directions. Table swivels 30°. No. 40 taper for main horizontal spindle, double swivelling universal head, dividing head and rotary table. Hardened and ground centre guide for slideways. Twin overarms. Double swivelling sliding spindle heads with speeds 53-3000 r.p.m Double swivelling universal head on retractable slide bracket providing with 5½in. Spacing Casting Drive assembly on 59 Machine 26in. daylight, and 21in. on No. 61.



MODELS 53 & 61. 16 universal head spindle speeds 21-1600 r.p.m.; 8 horizontal spindle speeds 21-1180 r.p.m.; 8 automatic feeds ½-18⅜in.

MODEL 59. 36 universal head spindle speeds 14-1780 r.p.m.; 12 horizontal spindle speeds 21-1180 r.p.m.; 16 automatic feeds ⅜-20in.

MODEL 54. Automatic cross feed of universal head 20in.; 18 universal head spindle speeds 12-1500 r.p.m.; 36 horizontal spindle speeds 6-1500 r.p.m.; 18 automatic feeds $\frac{1}{32}$-23⅜in.

Type	Table	Automatic Feeds Long.	Cross	Vert.
53	43½in. × 9⅞in.	27½in.	9⅞in.	15⅝in.
61	47½in. × 10⅛in.	30⅛in.	9⅞in.	15⅝in.
59	51⅛in. × 11⅝in.	34⅛in.	11⅜in.	21⅛in.
54	67in. × 14⅛in.	43⅛in.	14⅛in.	20½in.

Send for full particulars of our very extensive range of these machines; ask for demonstration.

Rudolph Carne & Co. Ltd. SWAN WORKS, FISHERS LANE, CHISWICK, LONDON, W.4.

Telephone: CHISWICK 0514 & 6585. Inland Telegrams: RUDCAR, CHISK, LONDON. Overseas Telegrams: RUDCAR, LONDON.

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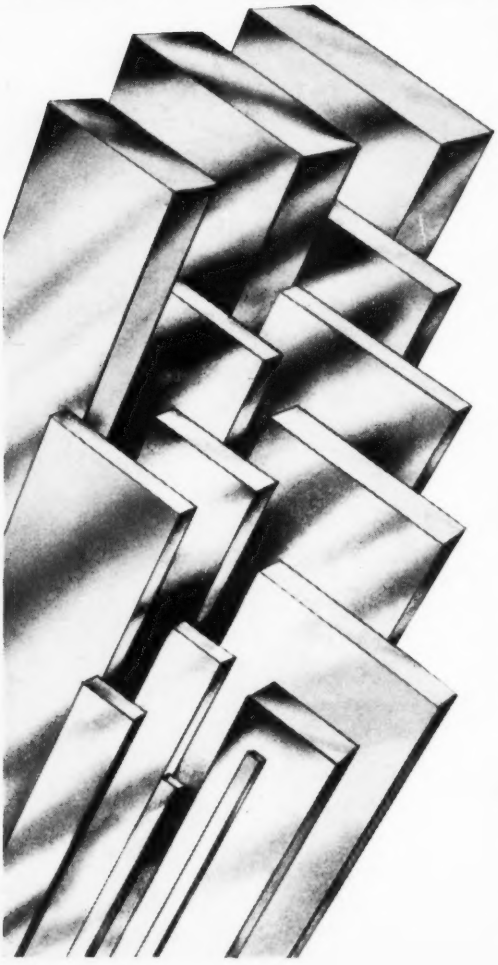
BRIGHT STEEL

FLATS



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Bright Drawn Carbon Key Bar B.S. 970: 1955 EN6A. Usakey is supplied in the form of Bright Drawn Steel Bars complying with the material specification of British Standard 46: Part 1: 1958 " Keys and Keyways."
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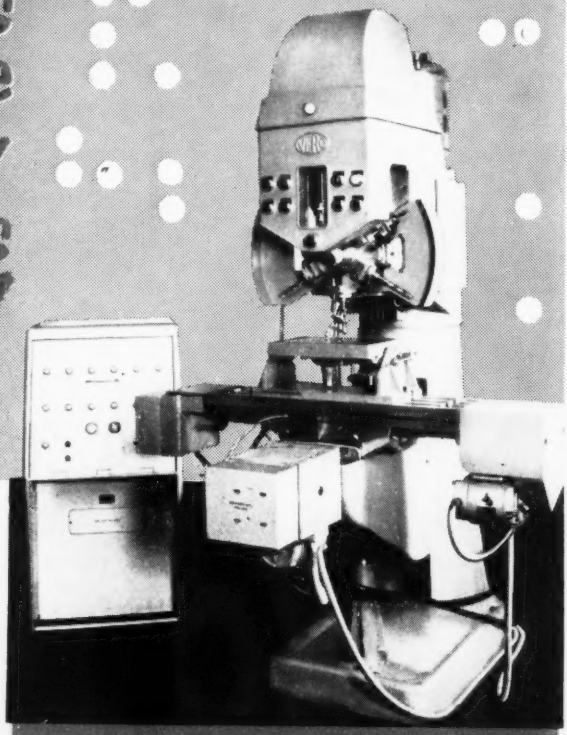

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AUTOSET automatic co-ordinate setting equipment provides accurate automatic control of the lead screws of a co-ordinate table. It enables the table to be positioned automatically by means of a punched tape (containing co-ordinate information for up to 400 operations) or manually by means of a series of knobs and dials.

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CUTS OUT ERRORS
Autoset is highly accurate—automatic compensation is provided for table backlash and cumulative lead screw errors.

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A complete equipment for automatic control in two dimensions including tape punch costs only £1,500. Manual control considerably less.

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No electronic valves used.

EASY MAINTENANCE
Autoset has been designed for trouble-free service and easy maintenance.

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This Full Automatic 6 Spindle Turret Drilling Machine has a maximum capacity of $\frac{7}{16}$in. in mild steel and enables components with up to 400 holes to be drilled, reamed, counterbored or tapped without supervision.
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Automatic backlash eliminator to table.
Automatic spindle stop.
Dynapoise (vibration damping) overarm.

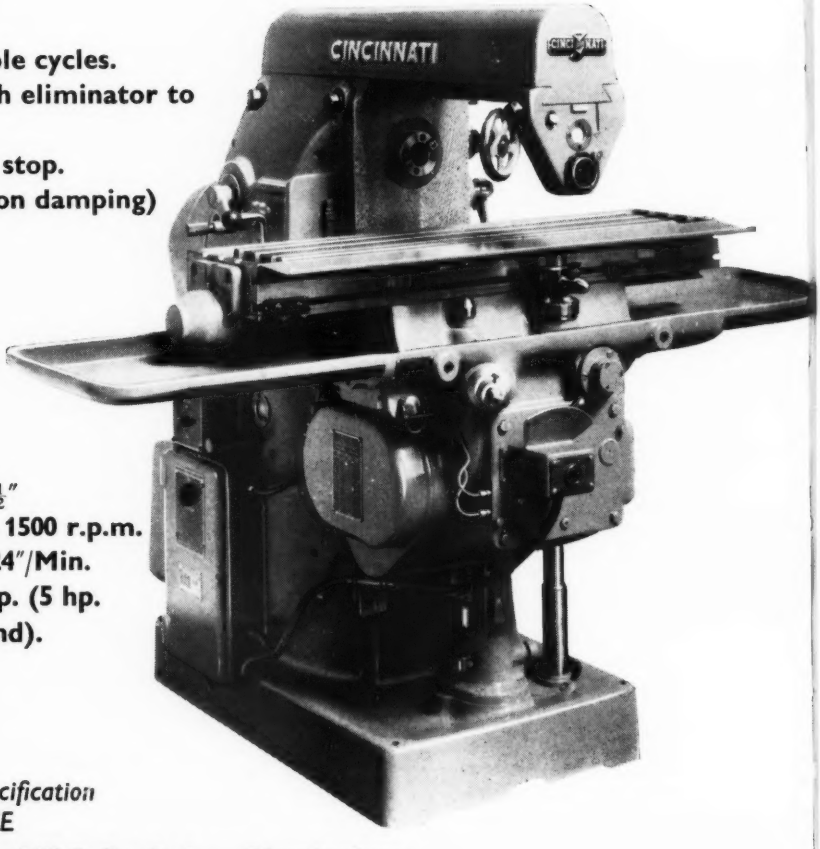

Table size 10″ × 35½″
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Write now for full specification
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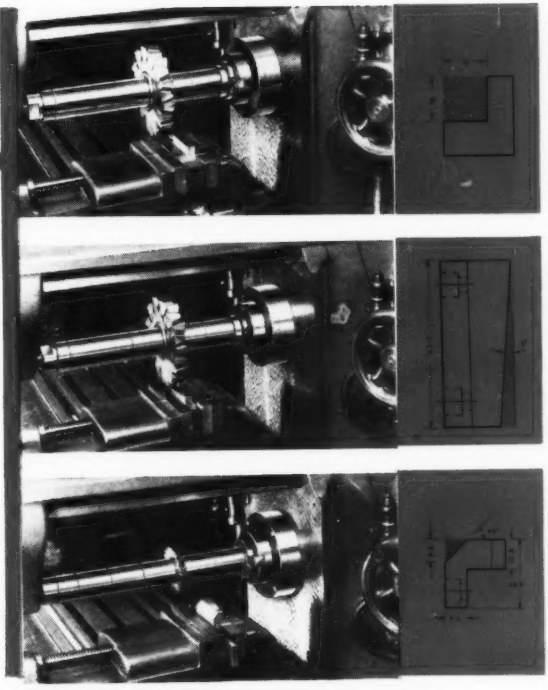

Operation 1

Mill step.
Set-up ... 16 mins.
Milling
(24 pieces) 39 mins.
Total 55 mins.

Operation 2

Mill 5° angle.
Set-up ... 4 mins.
Milling
(24 pieces) 39 mins.
Total 43 mins.

Operation 3

Mill chamfer.
Set-up ... 9 mins.
Milling
(24 pieces) 27 mins.
Total 36 mins.

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—two automatic indexing fixtures with automatic clamping and unclamping.

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Mill three slots in automobile transmission rings.
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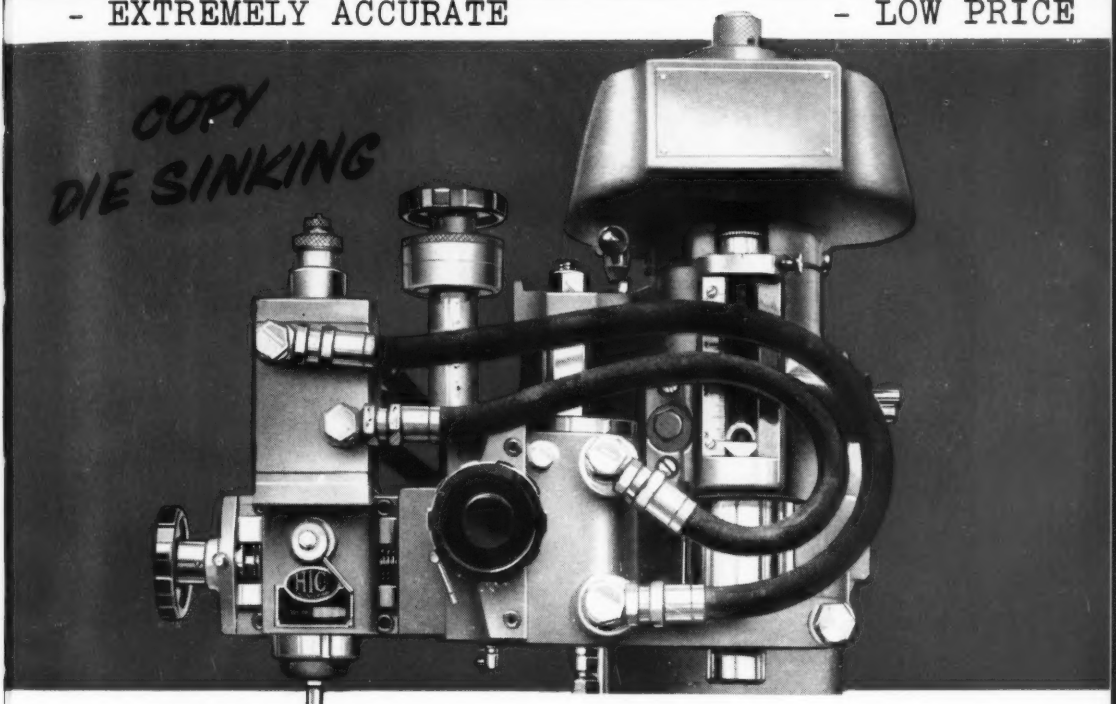

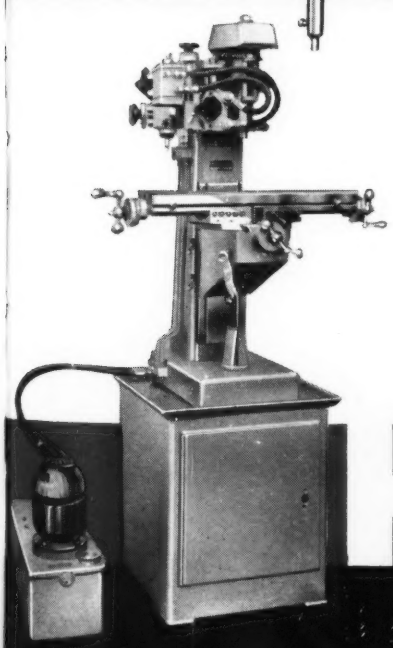

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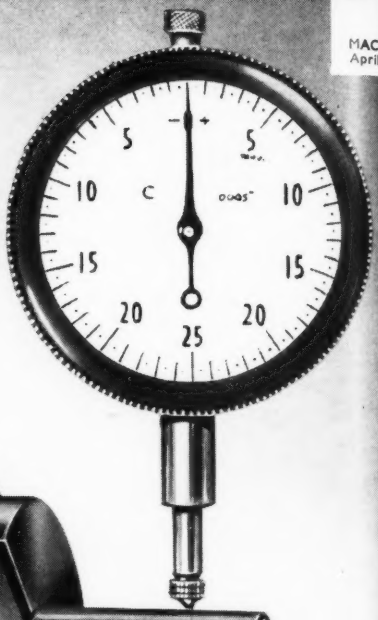

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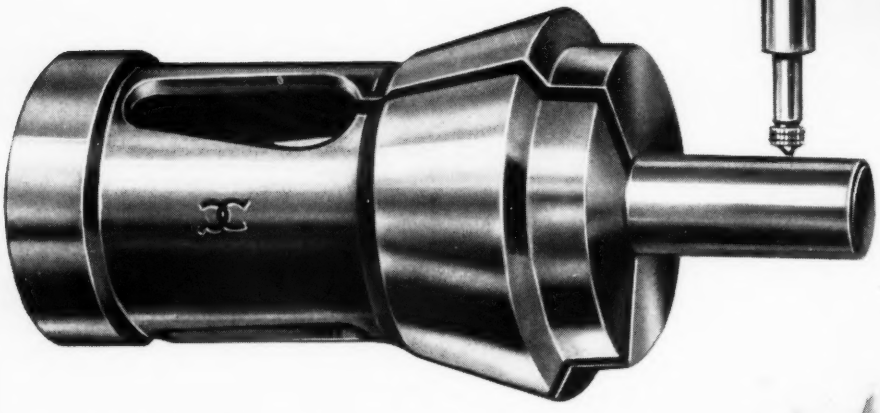

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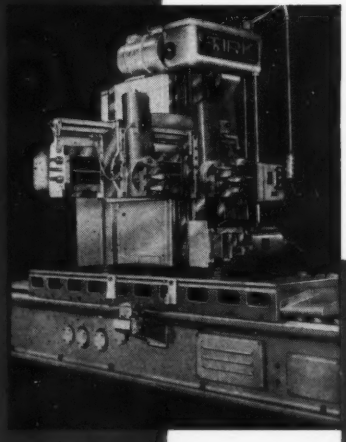

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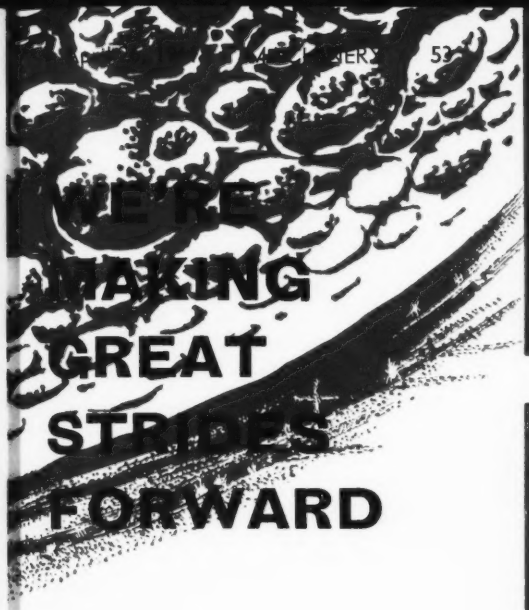

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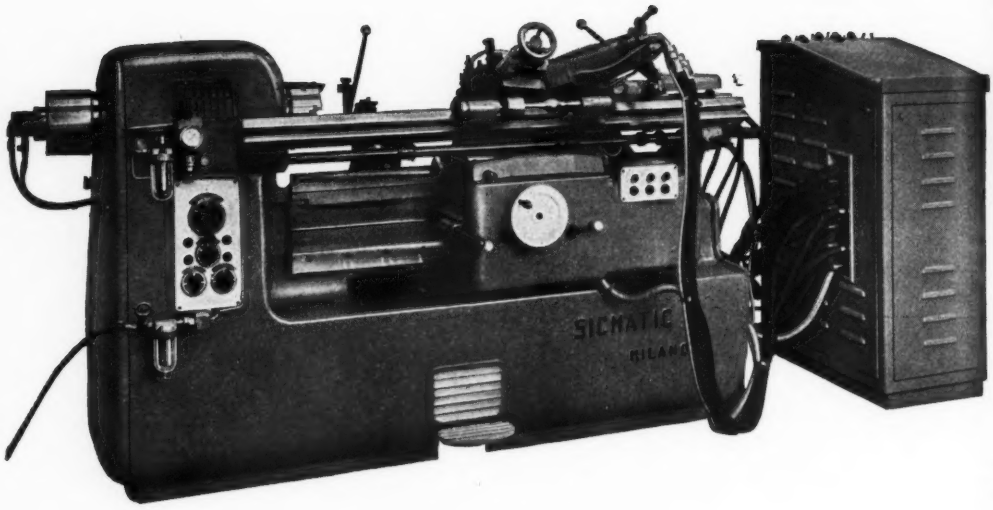

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Auto cycling up to six depths of cut.
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Basic price under £2,000.

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Max. swing over bed	15½in.
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Max. length turned	27½in.
Hydraulic traverse of copying slide	4in.
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Number of feed rates to copying slide	48
Max. tool pressure ..	1,300 lbs.

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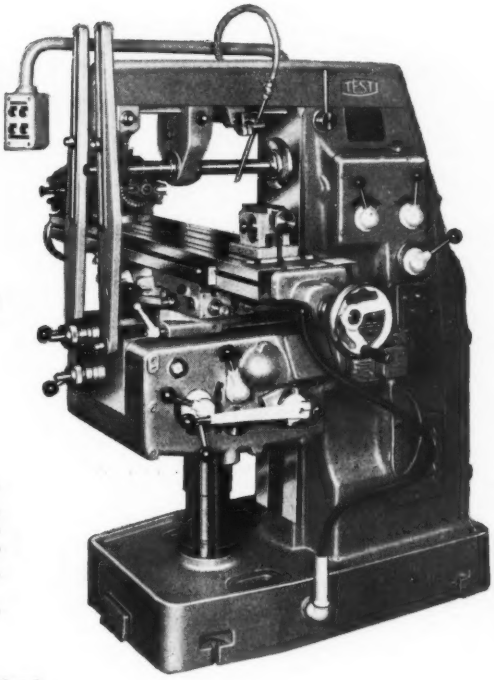

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BRIEF SPECIFICATION

Table:	Working surface ..	48in. by 11in.
Table Feeds:	Longitudinal	29in.
	cross (without brace) ..	9in.
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Spindle:	Spindle Nose ..	No. 40 N.S.
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STANDARD EQUIPMENT—COS-PAR Dividing Head Vertical Milling Attachment Arbor, Front Braces Coolant Equipment etc.

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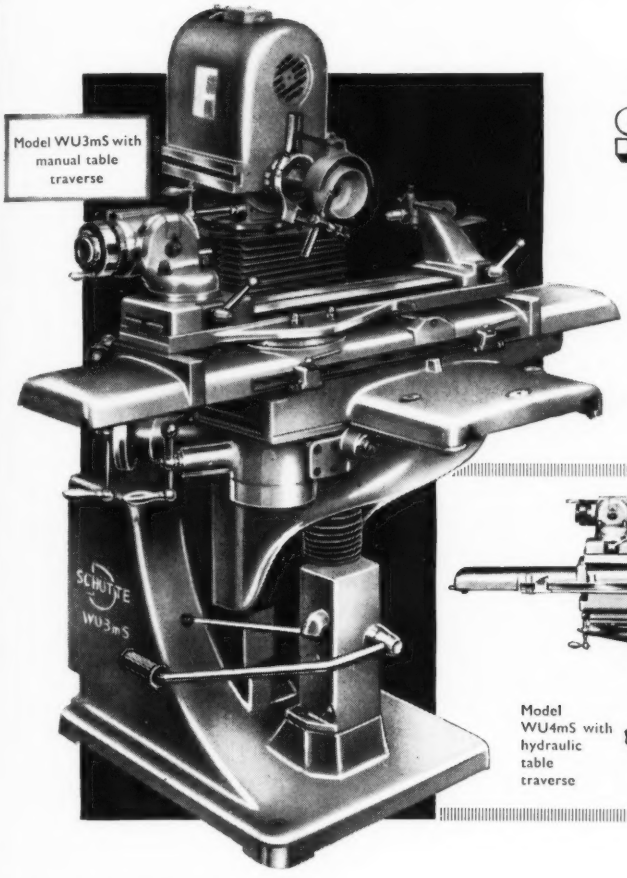

Model WU3mS with manual table traverse

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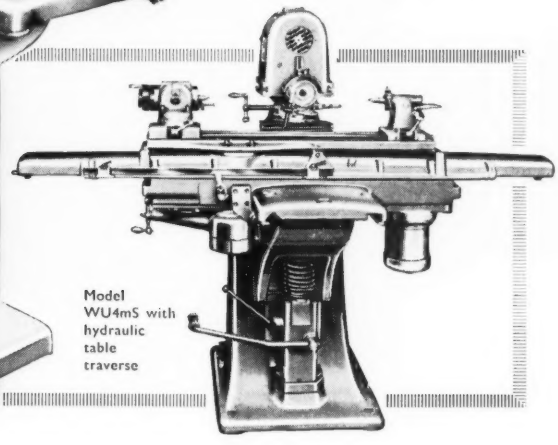
Universal TOOL & CUTTER GRINDERS



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Wide range of equipment — interchangeable on all models

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Distance between centres (standard)	12½"	20"	26"
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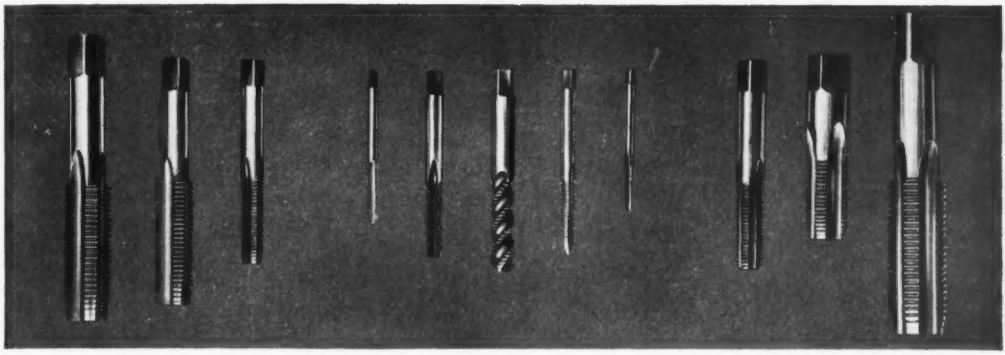

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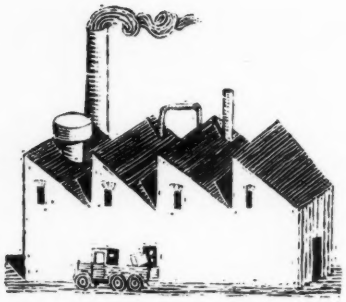

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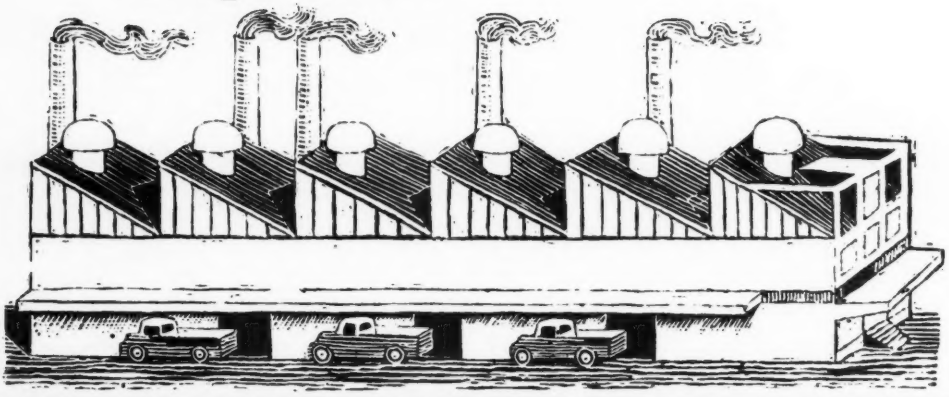

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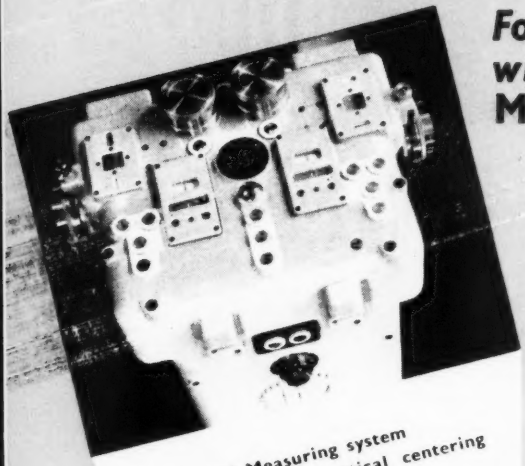

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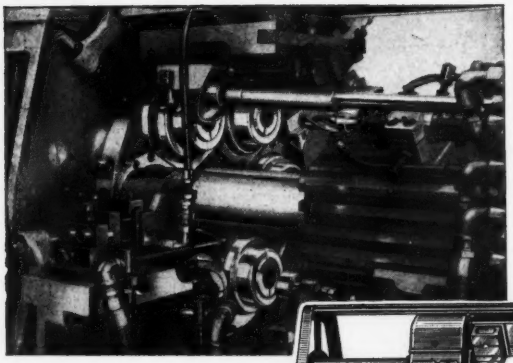
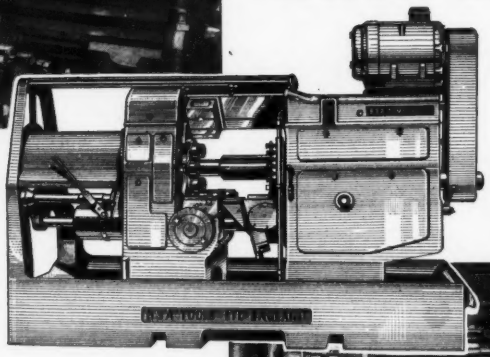


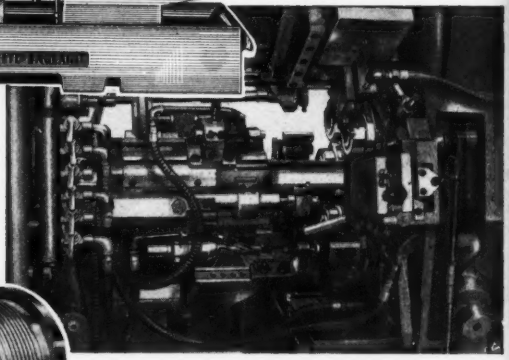
Tooling for the subject component showing the thread-rolling box (position 2) and the polygon box for generating the flats (position 3)

B·S·A

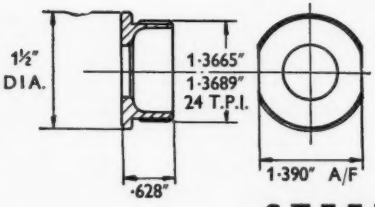
ACME-GRIDLEY

4
6
8 SPINDLE
automatics

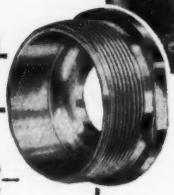




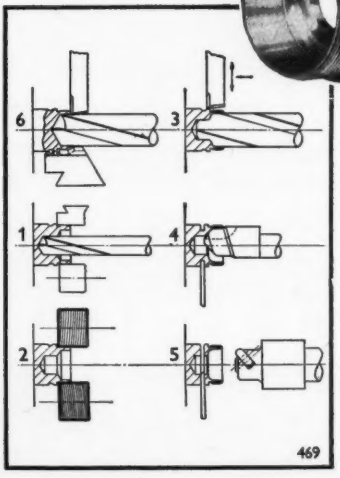
Showing the burnishing tool on the main tool slide at position 5.



STEEL



16·25 SECS



6: feed stock, form, undercut thread dia., rough O.D., rough bore, face to length.

1: rough drill, finish turn thread diameter.

2: roll thread.

3: generate flats, semi-finish bores.

4: bore, finish-machine ball track, breakdown for part-off.

5: burnish ball track, part-off.

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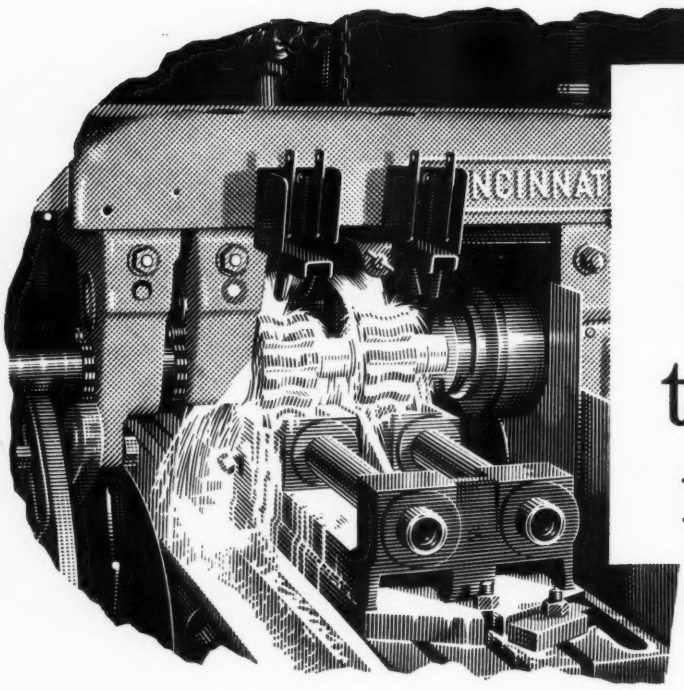

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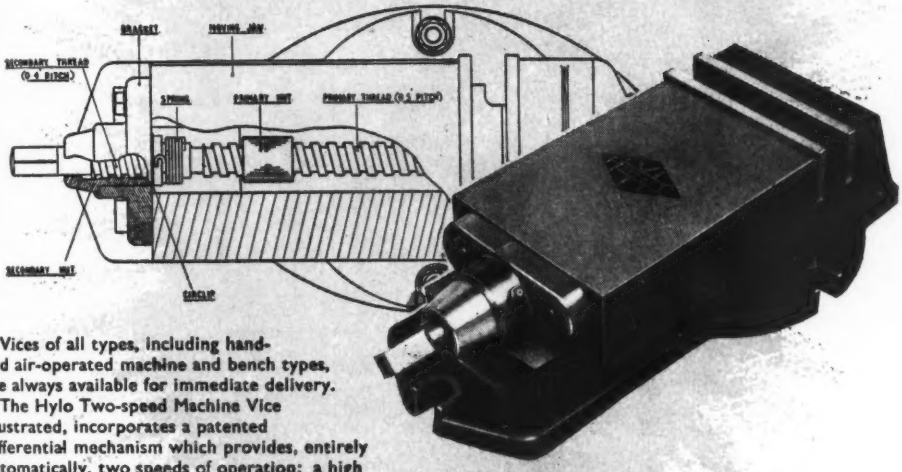

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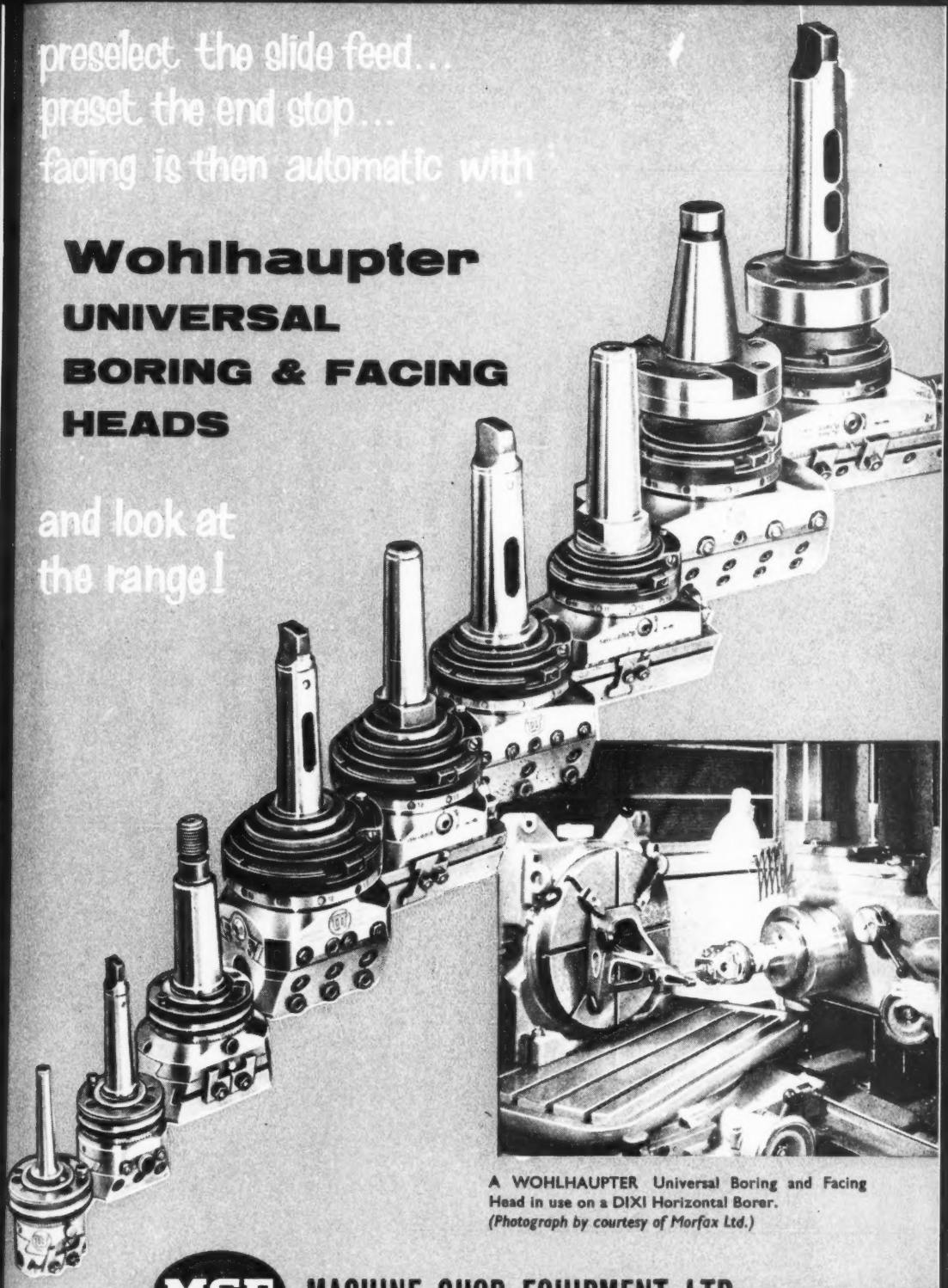

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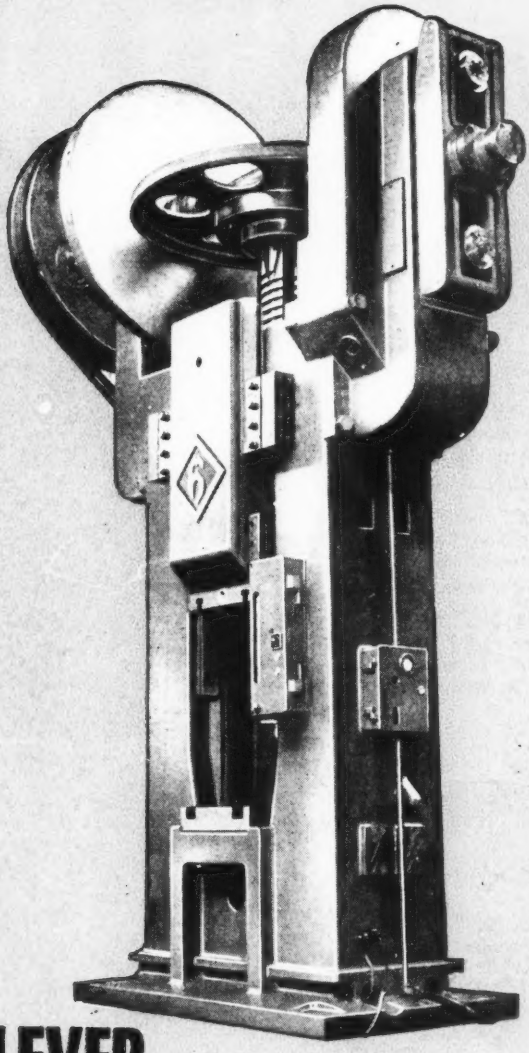

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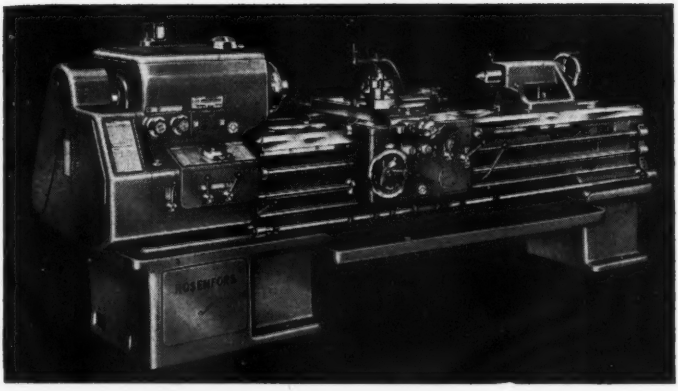

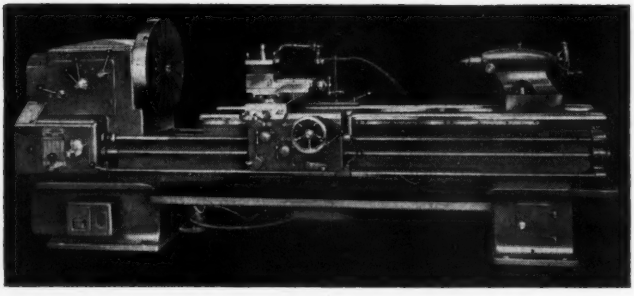

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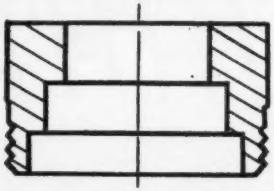
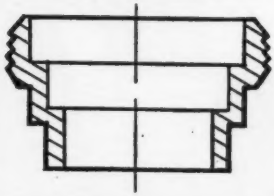


Operation 1
Loading 6 secs
Machining 28 secs
Material—BRASS (Billet)

SCALE FULL SIZE



Operation 2
Loading 6 secs
Machining 43 secs
Material—BRASS pre-machined blank from Op. 1.

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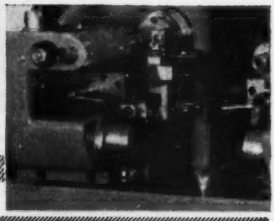

Illustration shows tailstock which is one of the many optional features available.

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Abstracts of Principal Articles

A Brazilian Machine Tool Plant .. P. 928

In this article, which concludes the series devoted to the production of lathes in large quantities by Maquinas Agricolas Romi, S.A., Santa Barbara d'Oeste, Brazil, reference is first made to the Romi Foundation, a welfare and social service organization instituted by the company, and to the technical training school that has been established. A prototype hydraulically operated turret lathe, used in the machine shop at the main plant, is then described, and the use of profile turning and thread chasing equipment on IMOR lathes is discussed. Assembly arrangements for lathes at the Santa Barbara works are next considered, and some details are given of various testing units, the company's Hydro-Velomatic drive unit, the Synchromatic feed gearbox, and the Prismatic 4-way tool-post. Finally, reference is made to the company's future development plans. (MACHINERY, 98—26/4/61.)

Spring Strip Preparation and Spring Manufacture .. .. P. 947

E. A. Knight & Sons, Ltd., Station Close, Potters Bar, Middlesex, stock and prepare all types of spring strip material for the manufacture of high-grade springs, the production of which they also undertake. An associated company, Sterling Springs, Ltd., manufacture and stock watch main-springs for the horological trade, and share the facilities of the same factory, which include gang slitting machines, capable of cutting minimum strip-widths down to $\frac{1}{32}$ in., and special edge grinders. A Swiss machine, provided with a series of abrasive bands, is used for polishing the edges of spring strip material. (MACHINERY, 98—26/4/61.)

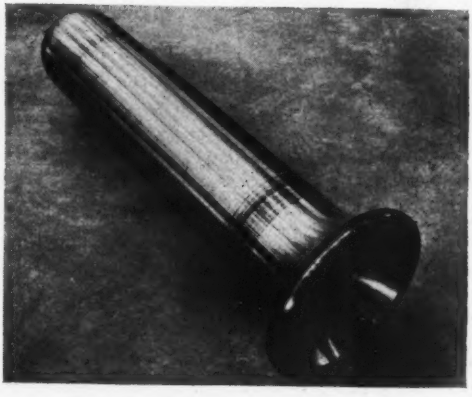
Recent Developments in Die Casting by the Alumasc Low-pressure Process P. 953

Recent developments in connection with the low-pressure die casting process operated by Alumasc, Ltd., include a mains frequency holding furnace which has been designed by the company in conjunction with Wild-Barfield Electric Furnaces, Ltd. A semi-automatic control unit has also been introduced, whereby the pressure of the air within the furnace for filling the die, and the period for which this pressure is maintained, can be accurately controlled. Dies for producing a 2-choke carburetter body, a box casting with vertical external walls, and a leg for a draughting machine, are briefly described. (MACHINERY, 98—26/4/61.)

Developments in the Pressure Die Casting of Steel .. .. P. 958

This article is an abridged translation of material which was published in the journal *Liteinoe Proizvodstvo* and gives an account of experiences gained during experiments in the pressure die casting of steel. The topics discussed include die design, die layout, melting and feeding the metal, casting under vacuum, and injection pressures and speeds. Details are given of some of the mechanical properties of die cast steels, also of the various materials from which the dies were made. (MACHINERY, 98—26/4/61.)

Twenty Centrispun tuyere blowpipes of the form here shown have recently been supplied by Firth-Vickers Stainless Steels, Ltd., to Appleby-Frodingham Steel Co., Scunthorpe. Produced from H. R. Crown 1 steel, these blowpipes have been fitted to the Queen Bess blast furnace at the South Ironworks of the company. They will provide for injection of pre-heated air at the rate of 85,000 to 90,000 cu. ft. per min. at a temperature of 750 deg. C. and a pressure of 30 lb. per sq. in. Initially the output of the furnace is expected to be 8,500 to 9,000 tons per week, but it is planned subsequently to raise the working temperature to obtain higher production



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If you know of a more efficient way of designing a tool, gauge, fixture, or mechanism, machining or forming a metal component, heat treating, plating or enamelling, handling parts or material, building up an assembly, utilizing supplies, or laying out or organizing a department or a factory, send it to the Editor. Short comments upon published articles and letters on subjects concerning the metal-working industries are particularly welcome. Payment will be made for exclusive contributions.

EDITORIAL

The Budget

In his recent Budget speech the Chancellor of the Exchequer stressed the need for resilience and flexibility in the economy to "cope with the demand of the home market and the need for increased exports". Our economic problems, he said, could not be solved either by sacrificing the balance of payments to achieve a faster economic growth, or by accepting economic stagnation in order to safeguard our external position. He recalled that he had stated on a previous occasion that we had the capacity to raise our national production by at least 3 per cent per annum over a period of years, but that an essential condition was a much larger increase in the percentage of our exports. As regards productivity, Mr. Lloyd suggested that the two sides of industry were not, in all cases, tackling the problem with sufficient energy. There were, he pointed out, too few scientists and technologists, and some industries were insufficiently accustomed to competition and insufficiently aware of the need for technical improvement if they were to hold their own with overseas competitors. Moreover, labour relations, standards of management, and techniques of selling, in some instances, were "below what is needed in the present day world."

After mentioning that the trend of expansion in investment, and particularly in the manufacturing sector of industry, appeared likely to continue during the current financial year, the Chancellor went on to discuss what are described as "economic regulators." Whereas the Budget must necessarily be the principal instrument of regulation, with changing conditions during the intervening periods, additional means of control are deemed desirable. Monetary methods, such as adjustment of Bank Rate, the special deposits scheme, and hire-purchase restrictions have their disadvantages, and other proposals were therefore put forward. There is, for example, provision for the Government to direct by Statutory Instrument, at any time of the year, that "either a special surcharge or a special rebate should be applied to all the main customs and excise revenue duties and to purchase tax." The maximum permitted change in either direction is 10 per cent, and it is an essential feature of the scheme that the percentage would be the same for the charges under "all the heads of revenue affected."

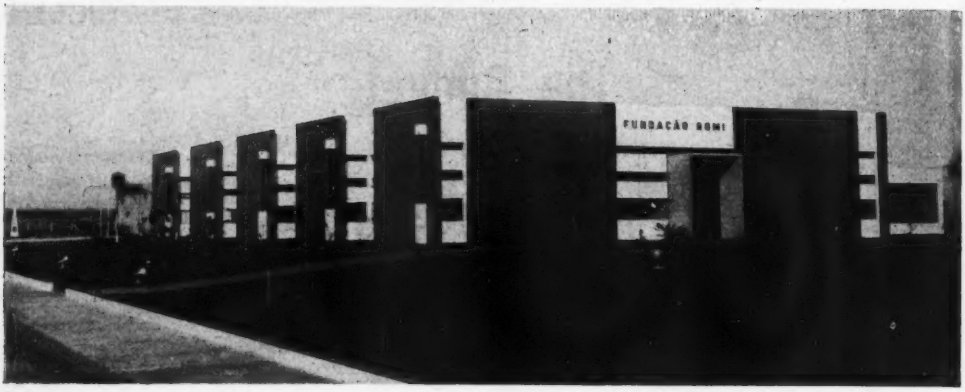
An additional means of regulation which has been proposed is the authority to apply a special surcharge on employers, "analogous to a payroll tax". As a temporary expedient, during the current financial year, such a surcharge, up to a maximum of 4s. per worker per week, would be collected "by attaching it to the employers' share of the national insurance stamp." It would, however, be an entirely new and separate element, the proceeds of which would be payable directly to the Exchequer. At the maximum amount, this surcharge would "withdraw from the economy" about £200 million in a full year. Apart from the degree of control that would thus be afforded, Mr. Lloyd suggested, the measure would have the added advantage "that when we are faced with a situation of chronic shortage of labour, it would act as an incentive to economy in the use of manpower and to investment in labour saving equipment."

In this connection it may be recalled that attention was drawn in MACHINERY, 98/751—5/4/61, to certain proposals put forward in the P.E.P. booklet "The Promotion of Economic Growth". Here, a payroll tax was suggested as one method whereby the inefficient use of labour could be discouraged, but it was advocated that, if applied, it should be a replacement tax and not an additional imposition. The authors of the booklet proposed that a payroll tax, should it be adopted, might be substituted, for example, for profits tax and local government rates paid by industry.

Under the Budget, however, powers will be assumed to apply a surcharge on employers and at the same time profits tax, far from having been removed, has been raised. It must also be pointed out that the authority to levy the surcharge expires at the end of the financial year, and that if Parliament is asked to grant similar power at the next Budget, fresh proposals will be put forward. If any plan is to have the effect of encouraging investment in labour saving equipment, it appears to us essential that there should be some reasonable assurance of stability and continuity. A company could hardly be expected to place orders for additional machinery as a direct result of the imposition of the surcharge, in the knowledge that it might be retracted or substantially modified long before delivery could be expected.

A somewhat similar situation is doubtless con-

(*Continued on page* 983)



A Brazilian Machine Tool Plant

Methods and Equipment Employed for the Production of Lathes in Large Quantities at the Works of Maquinas Agricolas Romi, S.A.

By P. A. SIDDERS, Chief Associate Editor

THE PRODUCTION OF COMPONENTS for IMOR lathes built by Maquinas Agricolas Romi, S.A., Santa Barbara d'Oeste, Brazil, was described in earlier articles in this series*, and reference was made to the foundry, forging shop, and other departments of the company's plant. IMOR lathes are being built in large quantities, in a variety of forms, including turret and roll-turning types, and certain of them were discussed in the first article of the series. Mention was also made of the social services that the company undertakes, and in particular of the Romi Foundation, and this institution will now be considered in some detail.

ROMI FOUNDATION

In 1950, the company instituted a provident scheme which was financed by an employee's contribution of 1 per cent of salary, and a contribution by the company of twice this amount. This scheme has been absorbed by the Romi Foundation, of much wider ramifications, which was inaugurated in 1957 by the late Americo Emilio Romi, founder of the company, who personally provided a large part of the initial capital of 35-million cruzeiros (about £70,000 at the current rate of exchange), the remainder being supplied by the company. The income derived from this capital is used to provide material, moral, educational, and recreational assistance for the employees of the company, also their wives and their children under 14 years of age.

A total of more than 2,700 people benefit from the various activities of the foundation, and have, for example, free medical attention from four doctors in Santa Barbara, also free hospital accommodation in the larger town of Campinas. Maternity and funeral assistance is also given. The recreational activities of the foundation include the provision of tennis and basket-ball courts, and other sports facilities, also free instruction in sports and physical training. More than 80 houses have been built by the Foundation for letting to company employees.

The Foundation has built, equipped, and staffed the technical training centre seen in the heading illustration. Of pleasing, modern design, the building is of single-storey construction, with a light and airy interior. It comprises a main workshop, which is rectangular in plan with five wings along each side (the brick end faces of which are prominent in the illustration), and an annexe, part

* MACHINERY, 98/116—18/1/61; 98/292—8/2/61; and 98/524—8/3/61.

of which is seen at the right. Situated on the outskirts of Santa Barbara, adjoining the new factory site, the building is surrounded by broad lawns, and there are sports facilities.

Fig. 1 is a view of the interior of the main workshop, and shows the turning section, with the milling section in the background. The machines are painted in light colours, and adjacent to each there is a floor-mounted cabinet for the storage of tools, chucks, and other equipment. Power for each machine is supplied by under-floor wiring to a junction box, above floor level, and junction boxes for the future installation of additional lathes may be seen at the left.

At the time of our visit there were 110 trainees, and this number will be gradually increased by successive intakes until the full capacity of 240 is reached—for example, in December, 1960, the number was raised to 150. Training is free, and the places available at the centre are awarded by competition, which is open to any boy who has satisfactorily completed his normal elementary education. The Romi company employs about 25 per cent of the trainees who complete the courses at the centre, but the other 75 per cent are free to take employment elsewhere.

Courses are currently provided in turning, fitting, and electrical work, and a view of the fitting section is given in Fig. 2. Training is supervised by fully qualified instructors, and practical work is supplemented by classes in workshop mathematics and theory. The practical courses are being extended to cover milling, grinding, toolmaking and pattern making, and eventually there will be advanced technical courses in mechanical engineering, electronics, hydraulics, works organization, and production methods. Classrooms for theoretical studies are in the annexe (at the right in the heading illustration), where there is also a small forge shop.

The centre is at present at the first stage of development, and has a total area of 24,220 sq. ft. This year, a second stage will be started, which will provide a further 37,265 sq. ft. of floor space when completed. Machines now installed comprise 19 centre lathes, one turret lathe, two universal milling machines, two shaping machines, three drilling machines and three pedestal grinders. During the second development stage, it is planned to provide five more centre lathes, one turret lathe, one copying lathe, one universal and one cylindrical grinding machine, a planing machine, one horizontal and one universal milling machine, a radial drill, a gear hobbing machine, a universal cutter grinder, and a horizontal broaching machine. The eventual cost of the buildings will be 16-million cruzeiros (£32,000) and of the equipment, 39-million cruzeiros (£78,000).

HYDRAULICALLY-OPERATED TURRET LATHE

The Romi company pay considerable attention to the extension and development of the range of products, and in Fig. 3 is seen a type MVR, hydraulically-operated, semi-automatic turret lathe, which is installed in the main machine shop of the Santa Barbara plant. This machine is of experimental design, and is being employed for normal production operations, under workshop conditions, in order to try-out the efficiency and robustness of

Fig. 1. View of the turning section in the technical training school established by the Romi Foundation. An exterior view of the school is given in the heading illustration

Fig. 2. Part of the fitting section of the Romi Foundation training school, which will eventually provide technical instruction for 240 boys

the hydraulic operating mechanism and controls.

Basically, the machine is a standard IMOR turret lathe, and is provided with hydraulic operating and control equipment for the turret slide, supplied by Lynn Manufacturing Co., U.S.A., also with the latter company's Hydro-slide unit for actuating the cross-slide. As may be seen, most of the equipment is mounted at the end of the lathe remote from the head-stock, and the turret slide is coupled to a hydraulic cylinder, which provides a maximum stroke of 15 in. A cutting force of approximately 3,000 lb. can be exerted with a system pressure of 1,000 lb. The self-contained hydraulic pump and reservoir unit has a delivery capacity of 5 gal. of hydraulic fluid per min.

Movement of the turret slide is controlled by means of the spool A, which incorporates six hexagonal stop bars. Two dogs are mounted on each bar, and the bar can be adjusted axially by a micrometer screw. The spool is indexed in phase with the turret, and for each turret position, the slide is advanced, at a rapid traverse rate of 22 ft. per min., until one dog trips a lever to actuate a micro-switch. Rapid advance then ceases, and the turret slide is moved forward at a feed rate that is steplessly variable from 0·3 to 220 in. per min., until the second dog trips the lever-operated switch. The turret slide is then returned at a rate of 26 ft. per min. At the end of its forward traverse, the turret can be caused to

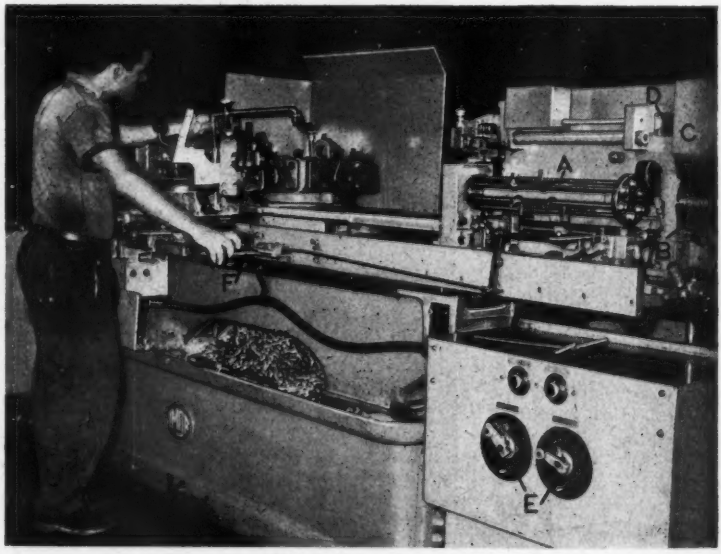


Fig. 3. This prototype hydraulically operated, semi-automatic, turret lathe is employed in the main machine shop of the Santa Barbara works

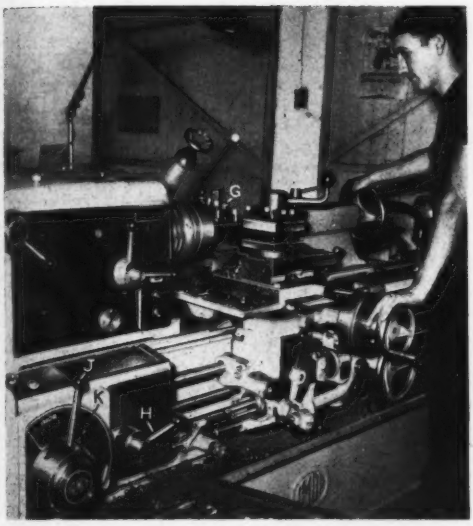


Fig. 4. Set-up for copy-turning pinion shafts on a type MVD lathe fitted with a Duplomatic hydraulically-operated profiling attachment. The machine is equipped with the company's Dialmatic gearbox for the feed motions of the saddle and cross-slide

dwell for a period that is steplessly adjustable from 0·2 sec. upwards.

A control drum *B* is mounted on the end of the shaft that carries the spool *A*, and above the drum there is a housing *C*, which contains 18 lever-operated micro-switches. There are 18 lines round the periphery of the drum, and six equally spaced holes are drilled and tapped on each line, the rows of holes along the drum corresponding to the turret faces. Pegs can be inserted in the holes to actuate the micro-switches and thus control the various functions of the machine, including feed and speed changing, indexing of the turret, and engagement of an intermittent turret feed motion, to facilitate drilling deep holes. A scale *D* on the unit indicates the length of traverse of the turret slide, for setting purposes, and the feed rates of the cross-slide in both directions of travel are set on the dials *E*, which are graduated for direct reading in inches per min. The operation of the machine is completely automatic, once the cycle has been started by means of the lever *F*. It may be mentioned that the Romi company is to build Lynn units under licence.

PROFILE TURNING AND THREAD-CHASING EQUIPMENT

The company is also to build Duplomatic self-contained, hydraulic profile turning equipment, and Filematic thread-chasing units, under licence from the Italian firm of Meccanica Applicazioni Oleodinamiche, s.r.l. These attachments are already being fitted to the company's machines, and Fig. 4 shows an IMOR type MVD centre lathe, equipped with a Duplomatic unit, set up for turning pinion shafts in the main machine shop of the Santa Barbara plant. The hydraulic copying slide *G* is mounted at the rear of the lathe cross-slide, and a circular master is carried on supports at the rear of the bed. Hydraulic power is supplied by a pump and reservoir unit, installed on the floor at the tailstock end of the machine.

Made from SAE 8620 nickel-chromium-molybdenum steel, each shaft is 1½ in. diameter at the large end, and 1⅛ in. diameter at the small end. Turning is carried out in two stages, and a spindle speed of 1,250 r.p.m., and a feed rate of 0·012 in. per rev., are used throughout. The total machining time for an 8$\frac{5}{16}$-in. long shaft is 3·6 min.

The MVD lathe is driven by a 10 h.p. motor,

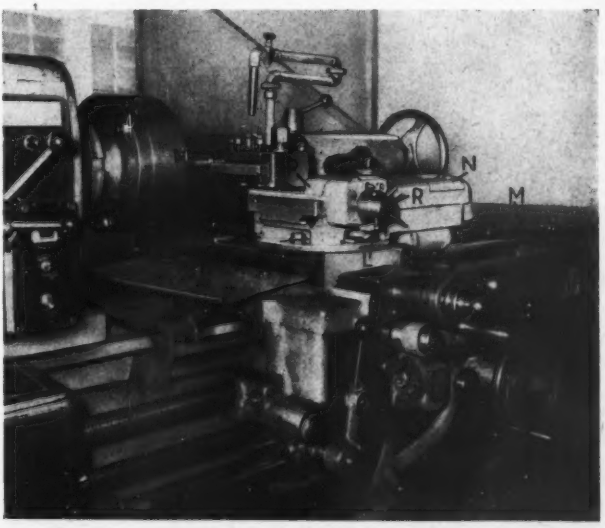


Fig. 5. An IMOR type MVN lathe equipped with a Filematic thread-chasing unit, for cutting threads on adjusting screws of SAE 8620 steel

Fig. 6. General view of the assembly shop at the Romi plant. Sub-assemblies are built in the section at the far end, and are passed to the main lathe assembly lines at the right

through the company's Hydro-Velomatic unit, and is fitted with a Dialmatic feed gearbox. Thirty-six different threads, of Whitworth, Metric, module or d.p. type, can be cut, and the gearbox incorporates a 9-gear cone, and two sliding pairs of gears. The lever *H* serves for engaging the sliding gears, and can be moved to four positions—up or down, in or out. There are ten positions for the lever *J*, which controls the tumbler gear associated with the cone of gears. The thread pitches or feed rates for nine settings of the lever, also a neutral position, are indicated on the dial *K*.

For changing a pitch or feed rate, the lever *J* is pulled outwards, and first withdraws a detent pin, and then moves the tumbler gear out of mesh with the cone of gears. The lever *J* is then swung into alignment with the required position on the dial, and this motion causes the tumbler gear to slide along a shaft, until it is in line with the appropriate gear on the cone. Next, the lever *J* is pushed inwards to move the tumbler gear into mesh with the cone gear, and at the end of this movement, the detent pin is engaged automatically to retain the gear in position. Change gears, within the cover at the left-hand end of the headstock, provide for selecting the various threads.

Fig. 5 shows an IMOR type MVN lathe with a Filematic thread-chasing unit on the cross-slide. Drive is taken from a gear mounted on the tailstock end of the leadscrew, through change-gears carried on a quadrant within a housing which is secured to the end of the bed, and thence to a telescopic shaft *M*. This shaft is coupled to a worm gear that drives a cam beneath the chasing slide *N*, which moves on ball guideways. The cam has two profiles, and the profile that imparts motion to the chasing slide is of true spiral form. Cams can be provided with rises up to 2 in., and motion over a corresponding traverse length is imparted to the slide in a direction parallel to the axis of the machine, the slide being moved in the opposite direction by springs.

At the headstock end of the chasing slide is mounted the tool slide *P*, which moves in a direction normal to the machine axis. Motion towards the axis is imparted by a sliding wedge-cam, within the chasing slide, which is moved by a second profile on the cam driven from the telescopic shaft *M*. The arrangement is such that the tool slide is moved inwards by the wedge-cam at the end of the return traverse of the chasing slide towards the tailstock. At the end of the working traverse, the tool slide is freed from the wedge-cam and is then moved rapidly clear of the work by spring pressure.

The inner position of the tool slide is controlled by a screw keyed to the capstan handle *R*. This screw is turned through a small angle at the end of each return stroke of the chasing slide by a pawl and ratchet mechanism. The pawl is mounted on a plunger that is free to slide vertically, and is moved upwards, against spring pressure, by a plate cam *L*. Travel of the plunger, and consequently the amount of in-feed applied to the tool slide at each cycle of the unit, is adjusted by a graduated knob above the capstan handle, and the increments of in-feed can range from 0·015 to 0·060 in. The single-point, carbide tipped chasing tool is carried in a tool-block, with provision for pre-setting for height, which is mounted in a quick-

change holder on the tool slide. Up to 40 chasing passes can be made, and the maximum length of thread that can be cut is slightly less than 2 in., and the maximum thread depth, 0·15 in. The unit is shown set-up for cutting ⅜-in. diameter, 14 t.p.i., NF form threads, in eight passes, on adjusting screws for MIN lathes, made from SAE 8620 steel. At a work speed of 1,000 r.p.m., the cutting time is 24 sec. Herbert Widdowson & Sons, Ltd., Canal Street Works, Nottingham, are the agents for Duplomatic and Filematic units in the U.K.

It may be of interest here to mention a test cut that was carried out on an IMOR turret lathe. The work material was a bar of SAE 8640 steel, of 2 in. diameter, and a ⅝-in. deep cut was taken at a feed rate of 0·040 in. per rev., and a speed of 500 r.p.m., using a tungsten carbide tipped tool. This machine is fitted with an air-operated chuck of 4 in. capacity, and is driven by a motor of 15 or 20 h.p. The spindle runs in Timken taper-roller bearings at the front end—the final drive gear being mounted between the bearings—and in a self-aligning ball bearing at the rear end.

ASSEMBLY ARRANGEMENTS

Part of the assembly shop at the Santa Barbara plant was shown in the heading illustration of the first article of this series, and another view of the shop is given in Fig. 6. In its present form, the shop is L-shaped in plan with one long bay, of 453 ft. by 50 ft. wide (at the right in Fig. 6), and a shorter bay of 236 ft. by 50 ft. Each bay is served by an overhead travelling crane, and supplementary hoists are carried by swinging cantilever arms, mounted on the columns that support the roof. As mentioned in the first article, the assembly shop is to be substantially enlarged, as part of the new expansion scheme.

Sub-assemblies are built in the smaller bay, and are transferred to the larger bay which is devoted to lathe assembly. Lathes are built in batches, of different types, and as may be seen, the machines in each batch are arranged in line. Assembly is carried out progressively, and after a completed lathe has been removed from the head of a line, all the other partially-completed machines are moved up. It is planned, as part of the expansion and improvement scheme, to install floor-mounted conveyors, on which the more popular lathes will be built. Painting of the completed lathes is undertaken in the installation at S, which incorporates a spray-booth with down-draught exhaust for paint over-spray and fumes, also batteries of infra-red lamps for drying. Lorries can be driven into the end of the long bay for removing finished lathes, as seen in the foreground, Fig. 6.

Production of lathes at the Romi plant is based on a 6-month programme, and the current programme calls for the building of more than 35 different types. At present, the plant has capacity for building lathes of type MVN—the most popular in the IMOR range—at a rate of 3,000 per year, of type MIN, at 400 per year, and of type MID, at 150 per year. When the development plans have been completed, the capacity for MIN and MID lathes will be 1,500 and 500 per year, respectively.

SUB-ASSEMBLY SECTION

In the sub-assembly section, headstocks are assembled at floor-mounted supports which are arranged in a row, parallel with benches at one side of the shop. The tolerances to which the components of IMOR lathes are made are such that there is virtually no fitting or selective assembly. Completed headstocks are passed to two testing and running-in stations at one end of the line, where each is run for a minimum period of 20 min.

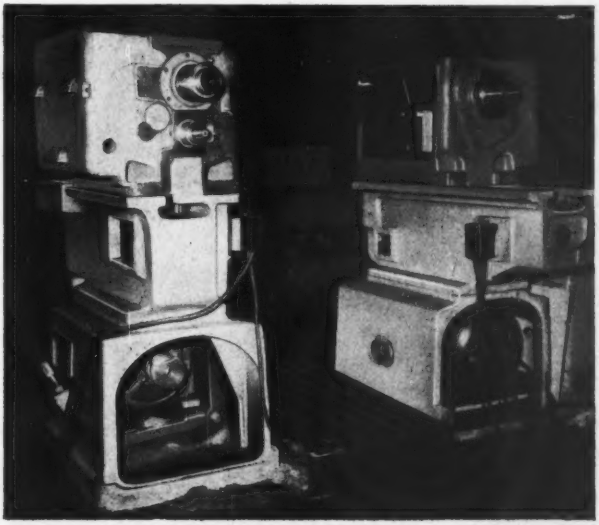


Fig. 7. Stands for testing and running headstocks for IMOR lathes after assembly. The stands are arranged so that both sets of controls can be operated from one position

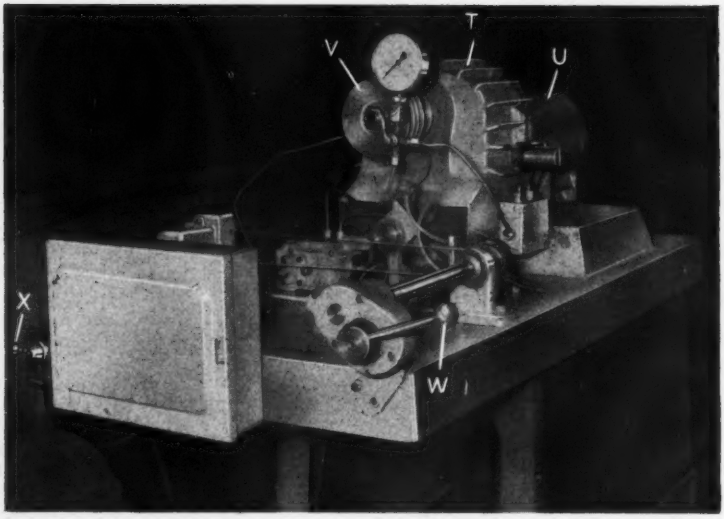


Fig. 8. Testing and running-in station for Electro-Hydraulic drive units before they are fitted to lathes. This unit provides for forward and reverse running, and a brake is applied during a change of direction

These stations are seen in Fig. 7, and at each there is a floor-mounted cast-iron pedestal, which corresponds to the headstock end of a lathe bed. Drive from a motor, on a swinging platform within the pedestal, is transmitted to the headstock input shaft by means of V-belts, as on the completed machine. The pedestals are arranged with the headstocks face-to-face, so that the controls of both are accessible from an intermediate position.

ROMI HYDRO-VELOMATIC UNIT

Reference has already been made, in an earlier article, to the Hydro-Velomatic drive unit developed by the Romi company. Although intended primarily for use on IMOR lathes, this patented unit also is suitable for incorporation in the drives of other machine tools, where rotation in the forward and reverse directions, also braking and neutral settings, are required.

The Hydro-Velomatic unit is coupled directly to the electric motor for the spindle drive, and it incorporates gears for reversing the direction of rotation of the output shaft, also multi-disc, hydraulically-operated clutch and brake units, for engaging and stopping the drive. Once started, the electric motor runs continuously in one direction, regardless of whether the output shaft of the unit is rotating or stationary. In consequence, the troubles associated with frequent switching on and off, and reversing, of the motor are avoided. A control lever provides for engaging the forward and reverse motions, also the neutral and brake settings. It will be appreciated that the operator of the machine has merely to move the lever from one setting to another, and since very little effort is required, fatigue is negligible. Moreover, starting, stopping and reversal are obtained instantaneously, and the control lever can be mounted in any convenient position on the machine, within easy reach of the operator.

Based partly on the principles applied in the development of the Hydro-Velomatic box, the Romi company has introduced a simpler unit for small lathes, which is known as an Electro-Hydraulic box. In this unit, only the brake is hydraulically operated, and the forward and reverse hydraulic clutches have been eliminated, change of the direction of rotation of the output shaft being obtained by reversing the electric motor. When the control lever of the unit is moved to reverse the direction of drive, the hydraulic brake is applied automatically, and the power to the motor is disconnected. As soon as rotation of the output shaft has stopped, the brake is automatically released, and a hydraulically-operated switch reconnects the supply to the motor for the reverse direction of rotation.

The arrangement of the unit is such that motion in the reverse direction cannot take place until rotation in the forwards direction has ceased. Pressure oil for operating the brake is supplied by a gear pump incorporated in the unit, when running in the forwards direction. Oil is also delivered to a hydraulic cylinder, coupled to an air cylinder, within the unit, which together form an air-hydraulic accumulator. During forward running, the air in the cylinder is compressed, and the pressure is applied to the hydraulic cylinder to operate the brake prior to reverse running.

A test-stand for the Electro-Hydraulic units fitted to type MID lathes is seen in Fig. 8, and is located

at one side of the sub-assembly department, the units being assembled at adjacent benches. The Electro - Hydraulic unit is indicated at *T*, and it is mounted coaxially with the driving motor *U*. If required, a gearbox can be mounted on the end of the unit, and coupled to the output shaft whereon the driving pulley *V* is fitted in the illustration. Valve gear on the stand provides for operation of the unit, and is actuated by the lever *W*, the driving motor being controlled by the switch *X*.

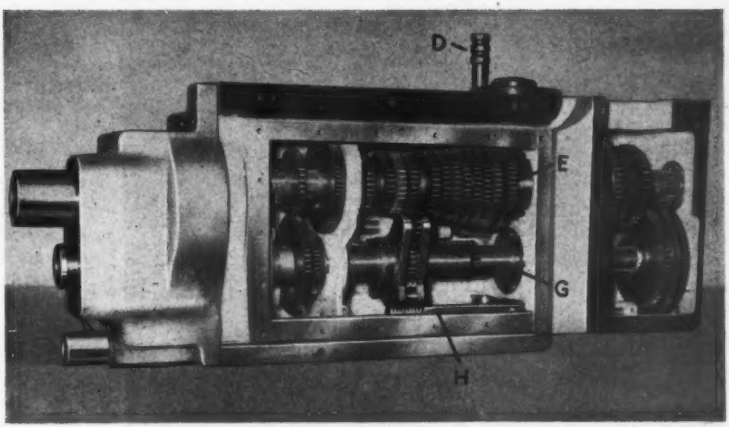


Fig. 10. View of Synchromatic feed gearbox from the rear. This gearbox is totally enclosed, when fitted to a lathe, and provides for cutting 384 different threads without the use of change wheels

Some details have already been given of the Dialmatic feed gearbox fitted to IMOR lathes, and Fig. 9 shows the testing and running-in arrangements for these gearboxes, adjacent to the assembly benches. A bench, built from cast-iron pedestals and a steel top, carries a countershaft *Y* and two angle plates *Z*, weld-fabricated from steel. The countershaft is driven from a motor *A*, and the angle plates are faced with rubber pads to prevent damage to the gearboxes.

A Dialmatic gearbox, as at *B*, can be secured to each angle plate by a U-shaped clamp *C*, which is faced with felt to protect the gearbox casting. Drive is transmitted from the countershaft by a flat belt to a large pulley mounted on the end of the gearbox input shaft, and the gearbox is run on test for a minimum of 30 min., during which period the output speed is changed periodically.

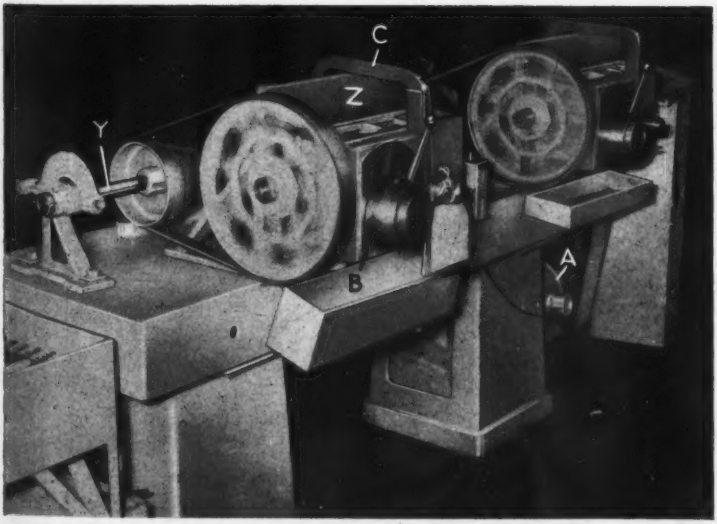


Fig. 9. Equipment for testing and running-in Dialmatic feed gearboxes before they are fitted to IMOR lathes

ROMI SYNCHROMATIC GEARBOX

The Romi company has developed a more advanced type of feed gearbox for use on IMOR lathes, which is known as the Synchromatic, and a view of one of these units, from the rear, is given in Fig. 10. Of patented design, the gearbox provides for cutting 384 different threads, without the use of change-wheels, comprising 96 threads of each of four types, namely, Whitworth, Metric, Module and dia-

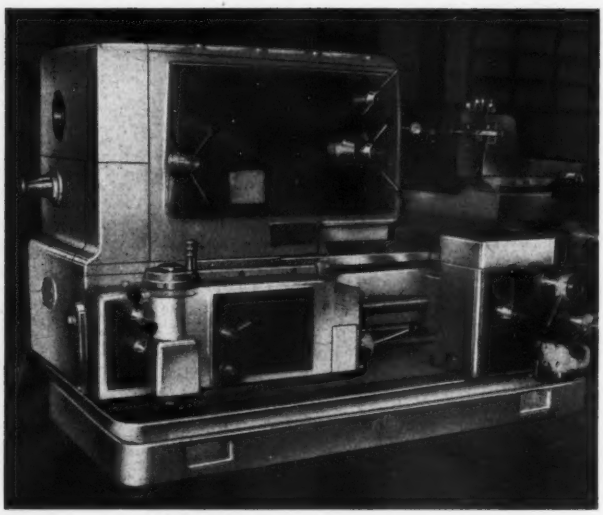


Fig. 11. An IMOR type MHS lathe, of 450 mm. (17·716 in.) centre height, is here being checked for run-out of the spindle. The machine is fitted with a Synchromatic feed gearbox

metral pitch. A total of only 31 gears is used in the box, and changes are affected by moving the handle *D*, and three levers at the front of the case. The gearbox drives a standard leadscrew, and the threads are produced to very close limits of accuracy, without any repetition. Since no change wheels are employed, the gearbox is totally enclosed, when mounted on the lathe. With this arrangement, dirt is excluded, and a combination of oil bath and force feed lubrication is permitted. All gears in the unit are hardened to Rockwell 60 C, and the shafts run in ball bearings.

In the Synchromatic gearbox there are three pairs of sliding gears, which are moved by the levers at the front of the case, and these gears may be seen at either end of the unit. There is also a cone of 12 gears, as at *E*, which are engaged by the tumbler gear *F*. This tumbler gear is mounted in a quadrant that can slide axially on the shaft *G*, and it meshes with a gear on this shaft. On the quadrant there are rack teeth, of arcuate form, to engage teeth on the sliding rack *H*, which moves in guides on the bottom wall of the casing, also gear teeth that mesh with the teeth of a long gear, parallel to the shaft *G*, at the front of the casing (behind the shaft *G* in the illustration).

The handle *D* incorporates a spring-loaded detent pin, and is pulled upwards to disengage the pin from holes in a cover plate on top of the casing. There are 12 holes, to correspond with the number of gears in the cone assembly, and the hole positions are numbered. The handle *D* is mounted on a disc which is keyed to a vertical shaft that is free to rotate, and this shaft is connected to the long gear by bevel pinions, also to the rack by spur gearing. To make a gear change, the handle *D* is pulled upwards to withdraw the detent pin, and is turned to the required setting, as indicated by one of the numbers. During this

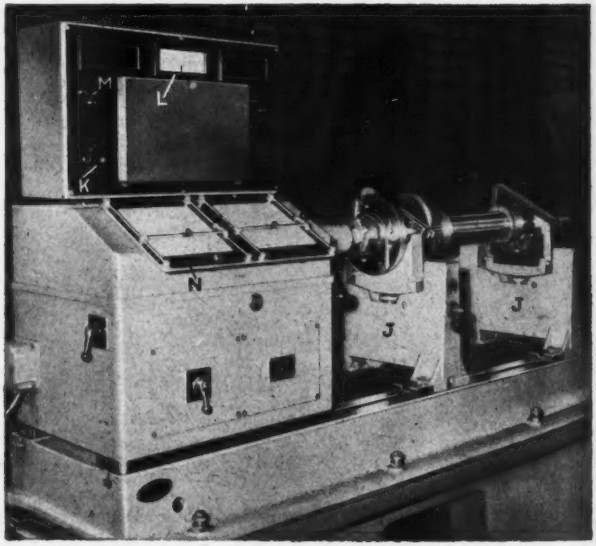


Fig. 12. Checking a spindle assembly for a type MVR turret lathe on a Carl Schenk dynamic balancing machine. All rotating assemblies for IMOR lathes are balanced in this manner

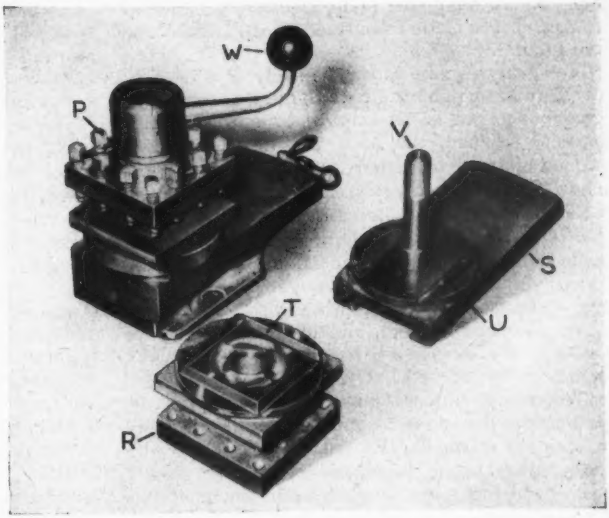


Fig. 13. A Romi Prismatic 4-way tool-post (left), with a body and base, showing the grooves and key employed for indexing location

movement, motion is imparted to the rack to move the quadrant and tumbler gear axially, and to the long gear to swing the quadrant and tumbler gear inwards or outwards, to align the teeth with the required gear on the cone.

A Synchromatic gearbox is seen on the IMOR type MHS lathe in Fig. 11, and provides for cutting 96 Whitworth threads from ⅛ to 30 per in., and similar numbers of Metric (1 to 240 mm. pitch), Module (25 to 60) and d.p. (½ to 120) threads. The three levers for operating the sliding gears may be clearly seen. This machine is of 450 mm. (17·716 in.) centre height, and is made with bed lengths to admit from 1 to 10 metres (3 ft. 3⅜ in. to 32 ft. 9¾ in.) between centres. Drive to the spindle, from a motor of 20 to 30 h.p., is taken through a Hydro-Velomatic unit, and speed ranges of 1·12 to 236 or 1·5 to 315 r.p.m. are available. There are 192 feed rates in both the longitudinal and transverse directions, ranging from 0·0025 to 0·728 in. per rev. and 0·0013 to 0·354 in. per rev., respectively. The bed of the machine is 650 mm. (25·590 in.) wide, with two upper prismatic guideways, and a flat guideway along the front. In the illustration, the machine is seen being tested for run-out of the spindle, during the latter stages of assembly, with a dial indicator mounted on the front tool-post. The stylus of the indicator is in contact with a cone centre in the spindle, and the maximum run-out registered was 0·005 mm. (0·0002 in.).

DYNAMIC BALANCING

All rotating assemblies for IMOR lathes are dynamically balanced on a Carl Schenk machine, which is seen in Fig. 12, set up for balancing a spindle for a type MVR turret lathe. This balancing machine will accommodate work weighing up to 100 kg. (220 lb.), and a larger unit, by the same maker, is to be installed, which will have a capacity for components up to 300 kg. (661 lb.).

The assembly to be checked is loaded on to the supports *J*, which can be adjusted along the bed of the machine, and each support incorporates two roller bearings, whereon the work rests. Drive from the machine spindle is transmitted to the workpiece by a flexible coupling. At the left-hand side of the machine control panel, there is a selector switch *K*, whereby the horizontal and vertical pick-ups associated with the left- and right-hand supports can be connected to the meter *L*, the scale of which is calibrated in positive and negative values. The pick-up that is connected is indicated by either of two signal lamps, as at *M*.

Below the panel there are two polar co-ordinate charts, as at *N*, and a horizontal bridge member with a sliding pointer spans each chart, and is free to slide on vertical guides. The two values obtained from the meter for each pair of pick-ups are transferred to the corresponding chart, from which are read the value of the equivalent balancing mass, also its angular and radial positions. An equivalent mass of modelling clay is attached to the workpiece, the flange of the machine spindle being calibrated to facilitate setting at the required angle. After a balancing mass has been added, the work is re-checked and the mass adjusted if necessary, and an equivalent weight of metal is subsequently removed from the assembly at a diametrally opposite position.

PRISMATIC 4-WAY TOOL-POST

In an earlier article, mention was made of the Prismatic 4-way tool-posts, of patented design, which are fitted to IMOR lathes. These tool-posts, with other auxiliary equipment, are built in the assembly shop, and an example is seen at *P*,

Fig. 13. A tool-holder body, inverted, is indicated at *H*, and it is made from steel, which is hardened and ground.

The body can be indexed to any of four positions, at 90 deg., on the base *S*, but a conventional taper-ended peg is not employed for location purposes. Instead, the body has four accurately-ground slots, of truncated triangular cross-section, as at *T*. An accurately-ground, hardened key *U* is fitted to the base, and this key is engaged by one of the slots in the body, to locate the latter in each position. This method of location, and the length of the mating surfaces, permit heavy cutting operations to be undertaken in either direction of rotation of the work, and it is stated that the locating members have been proved to be virtually free from wear.

When the body is mounted on the base, it passes over the spigot *V*, and is urged upwards by a spring. A handle *W* is screwed on to the threaded end of the spigot, and incorporates ratchet teeth, which engage similar teeth machined integral with the body. By moving the handle in one direction, the body is unclamped, lifted clear of the key on the base, and turned through the required angle to bring the next tool into the working position. Then, by moving the handle through a small angle in the opposite direction, the body is re-engaged with the key and locked in position. The indexing cycle is completed in less than 2 sec., and the operator uses only one hand.

EXPANSION PLANS

To conclude this series of articles on the activities of Maquinas Agricolas Romi, S.A., brief reference may be made to the company's expansion plans. In 1959, when certain of the heavier branches of engineering industry in Brazil were already successfully established, the government founded an organization known as Grupo Executivo da Industria Mecanica Pesada (Executive Group for Heavy Mechanical Industry). This organization is usually referred to as GEIMAPE, and was set up to encourage the growth of heavy industry, and to co-ordinate and facilitate future expansion. One of the objectives of the organization, to which special importance was attached, was the provision of facilities for the importation of the machines and equipment required for the expansion of existing plants, and for the establishment of new firms.

The Romi company has presented an expansion plan to GEIMAPE, which, when fulfilled, would substantially improve the supply of machine tools to Brazilian industries, and place these industries in a position that would be comparable to those of other manufacturing nations. Government approval of this plan was received last December, and the principal aims of the scheme are:—(1) to improve productive capacity of the Romi plant for heavy and extra-heavy lathes; (2) to extend the facilities of the company for building hydraulic units, also hydraulic and electric copying systems; (3) to initiate the large-scale production of automatic, copying, and multi-tool lathes, radial drilling machines, and special-purpose machine tools which are designed to be constructed from standardized units.

A 2-stage expansion programme was covered by the Romi plan, which should be completed by 1964, and provides for the installation of new facilities for machining components for heavy and extra-heavy lathes, also the construction of new buildings to house the machining and assembly departments, and a new foundry.

The first stage, due to be completed by the end of 1961, involves the removal of the assembly sections for heavy and special machines to new buildings near the Romi Foundation in Santa Barbara d'Oeste, and the installation of the first group of new machine tools. Among the facilities to be provided by the second stage, which is to be completed by 1964, will be the new foundry. This department will be fully mechanized, and will initially undertake the production of castings with individual weights up to 25 tons, and ultimately up to 40 tons.

Equipment to be imported for the Romi expansion programme will include a number of planing machines, horizontal boring machines, jig boring and milling machines, gear shaping and grinding machines, plain and cylindrical grinding machines, radial and multi-spindle drilling machines, and special-purpose units. It is anticipated that new buildings with a total area of 270,000 sq. ft. will be constructed during 1961 and 1962.

NYLON HOUSING FOR PORTABLE DRILL. In a recent issue of the Du Pont Magazine attention is drawn to the moulded nylon housing which is being employed for the Safe-T-Drill portable power tool made by the Millers Falls Co., U.S.A. It is explained that this material was adopted in order to provide a " double insulated " tool. Du Pont Zytel nylon is employed, and it is stated that in addition to the increased electrical protection afforded, assembly has been facilitated owing to the accuracy of the mouldings, and machining operations required on metal housings have been eliminated. It has also been possible to reduce the weight of the tool by 20 per cent.

East German Machine Tools at the Leipzig Fair

By R. E. GREEN,
Associate Editor

ABOUT 130 MACHINE TOOLS were shown in the section devoted to the East German machine tool industry at this year's Leipzig Spring Fair, by some 37 of the total of about 50 factories engaged in their production. During recent years, the number of different designs of machine tools made by the industry, which at one time totalled some 1,200, has been steadily reduced, under arrangements made through the Council for Mutual Economic Aid. These arrangements provide for the simple machine tools to be imported from other East European countries with less highly-developed technologies, and are intended to allow the East German industry to concentrate on advanced designs arranged for a high degree of automatic operation.

Some 500 different basic designs of machine tools are now being built, this number being approximately trebled if variations and size ranges are taken into account, and a total of about 65,000 machines was produced last year. Among these machines, the proportion designed for partly or fully-automatic operation has been gradually increased, and those intended for incorporation in fully automatic link lines accounted for 26 per cent of production by the end of 1960. At that time, the proportion of other automatic machines was 45, of machines fitted with automatic loading and unloading equipment 11, and of non-automatic machines, 18 per cent of the total.

In contrast with previous years, somewhat less emphasis was placed on new developments by the East German machine tool building factories at the recent Fair. Instead, attention was drawn particularly to further development of the more successful designs, and to the extension of the system of unit construction, for example, for drilling, milling, honing, grinding and gear-cutting machines, and lathes. Basic units, for incorporation in machines of similar types, were shown on many stands by means of actual assemblies, separate units such as heads, models, photographs, and drawings. Of the 130 machines mentioned, about 50 represented further developments of existing types, completely new designs, designs modified to take advantage of unit construction, and special-purpose machines, of which there were several interesting examples.

Among standardized units employed on machines shown at the Fair may be mentioned spindle heads, beds, tables, columns, gearboxes, hydraulic chucks, swarf conveyors, and hydraulic copying units. Several examples of linking mechanisms for the transfer of parts from one machine to another in a production line were shown, notably in connection with a multiple drilling installation and between a pair of single-

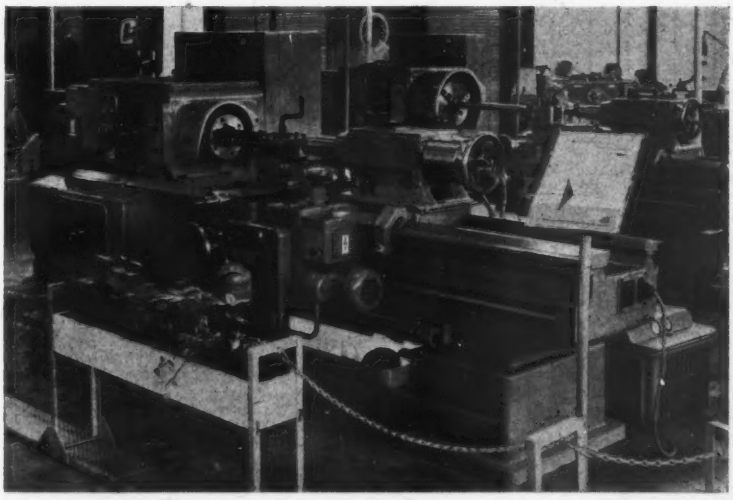


Fig. 1. These two lathes, which are exported under the trade name Niles, have swing capacities of 19·68 and 24·8 in., and incorporate various common components designed to enable production to be carried out on larger batches so that manufacturing costs are reduced

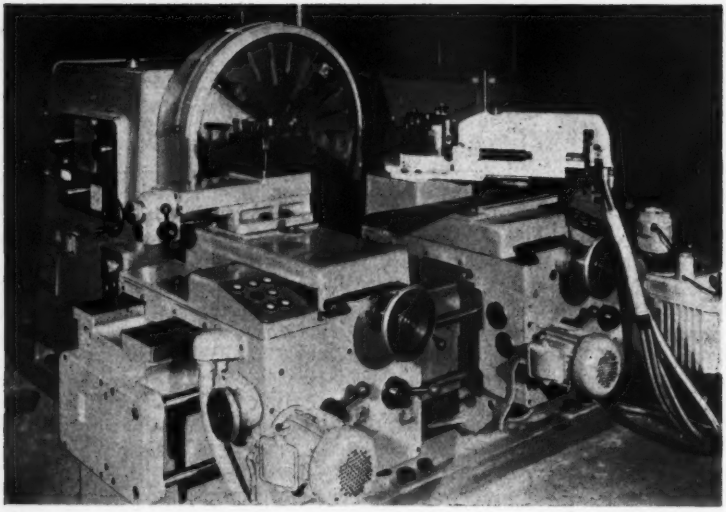


Fig. 2. This Zerbst facing lathe is the second smallest of a range of four sizes. It is seen with a hydraulically-operated copying slide mounted on the tool slide at the right

spindle automatics. Similar equipment for handling sheet metal parts such as threaded container lids was also shown, and demonstrations were given of a forging line on which billets were cropped from the bar, induction heated, and forged into pipe flanges in a 2-station die, all under automatic control. Some of the more interesting of the machines on view are described here, and others will be considered in further articles, to be published shortly.

NILES LATHES INCORPORATING STANDARD UNITS

Two examples from the range of sliding and surfacing lathes made by the VEB Grossdrehmaschinenbau "8 May", Karl-Marx-Stadt, W 30, Otto-Schmerbach-Str. 3-5, which incorporate various standardized units, are seen in Fig. 1. These two machines have swing capacities of 19·68 and 24·8 in. over the beds, and are made to take lengths up to 16 ft. between centres. A larger size is also made, to swing 31·5 in. over the bed, and admit lengths up to 19·6 ft. The range is designed to utilize many common parts with a view to increasing the batch sizes in which such parts are made, to enable costs to be reduced.

These parts include the spindle, with the associated gearing and main drive motor; the feed gearbox and driving motor; the feed shaft; speed and feed selection units; a hydraulic chuck, when fitted; and various parts of the saddle including the compound rest. By the use of various combinations of these parts it is possible for the builders to produce a variety of machines with characteristics suitable for specific applications. For example, drive to the spindle may be taken through any of four different arrangements of gears, which provide ranges of 9, 12, 16, and 24 spindle speeds. These speeds progress geometrically with ratios of 1·25 or 1·6, and cover ranges of 1 to 6·15 and 1 to 100, with speeds from 224 to 1,400 r.p.m., in 9 steps, and 18 to 1,800 r.p.m., in 24 steps, for example. Main drive motors of 9, 13 or 18 h.p. are fitted to the smaller lathes, and of 13, 18 and 27 h.p., to the largest in the range.

Feed mechanisms also are designed to provide several alternative ranges, according to the work for which the machine is to be used, and may give 9, 16 or 32 steps, or stepless variation. Feeds on the smallest size of machine, in the foreground in Fig. 1, for instance, range from 0·18 to 2·5 mm. (0·007 to 0·098 in.) for longitudinal, and 0·071 to 1 mm. (0·0028 to 0·039 in.) for transverse movements. Provision can also be made for finer feeds, for rapid traverse, and for cutting Metric and English threads.

On these lathes, the other variations from standard include the provision of hydraulic copying equipment at the rear of the cross-slide, higher accuracy of the various machine elements to comply with the German DIN 8605 specification, a hydraulically-operated tailstock, remote control of a maximum of 6 spindle speeds and 3 feed rates during one cycle, and programme control by means of a punched card system housed in a separate cabinet.

FACING LATHE WITH COPYING SLIDE

Another example representative of a range of machines incorporating certain interchangeable elements is the type DXP 800 facing lathe shown in Fig. 2, which was exhibited by VEB Werkzeug-

maschinenfabrik, Zerbst, Karl-Marx-Str., 43-45. This machine is the second smallest in a range of four, with swing capacities from 24·8 to 50 in. It has a swing of 31·5 in., and the distance from the faceplate to the bed carrying the facing slides is 10·23 in. Work up to 24·8 in. diameter can be swung over the bed.

Each machine has 12 spindle speeds, with a choice of three ranges of 8 to 355, 11·2 to 500, and 16 to 710 r.p.m. If required, the spindle drive can be arranged for stepless variation from 2·8 to 710 r.p.m., and equipment is available which gives constant cutting speeds for facing operations. There are 10 feeds, from 0·0025 to 0·055 in. per rev., selected by levers, and rapid traverse at 7 ft. per min. is provided. Motors of 18·7 and 25·5 h.p. are fitted to the two smaller and the two larger machines in the range.

Special equipment which can be supplied includes the Magdeburg hydraulic copying slide seen at the right-hand end of the bed, which operates from a flat template. It is stated that equipment for programme control of slide motions can be supplied.

DRUM-TYPE TURRET LATHE WITH PUNCHED-CARD CYCLE CONTROL

Drum-type turret lathes, made in two sizes, for material of 1·417 and 1·968 in. diameter, by VEB Drehmaschinenwerk Leipzig, N 26, Pittler-Str., 26, were shown with the cabinet in the foreground in Fig. 3. Equipment in this cabinet provides for the automatic selection of the required spindle speed in either direction of rotation, and feed rate, for each turret position. The various speeds and feeds are specified on the tool layout drawing, and are represented by holes which are subsequently punched in a card. The card is placed in position over a socket panel in the right-hand side of the cabinet, and plugs are inserted through the holes into the sockets.

These plugs complete circuits which are energized during the machine cycle by means of a shaft turned by the turret. The shaft carries stops which operate limit switches to control the various changes, and provision can be made for spindle reversal for tapping operations, if desired. As the speeds and feeds are changed, the selected values are shown by the illumination of push-buttons on the left-hand panel of the cabinet, each button being marked according to its function. These buttons can be used to select speeds and feeds manually, during setting-up, and they complete the same circuits as the limit switches on the machine, to operate electro-magnetic clutches in the spindle head and the feed gearbox.

On each machine there are 16 spindle speeds, obtained from a 2-speed motor and constant-mesh gearing with magnetic clutches, and on the type DRT 50 eL shown, speeds range from 45 to 2,240 r.p.m., in geometrical progression of 1·6. Each machine has 12 feed rates, from 0·0018 to 0·039 in. per rev., longitudinally, progressing in a ratio of 1·4. These feeds are obtained from a gearbox at the right-hand end of the bed, through electro-magnetic clutches, and are automatically disengaged at pre-set positions during the cycle. Built-in dial gauges provide for accurate setting of the limits of tool travel in both longitudinal and transverse directions. For thread-cutting with chasers, an automatic mechanism provides for infeed, during 4 to 12 passes, to the pre-set depth.

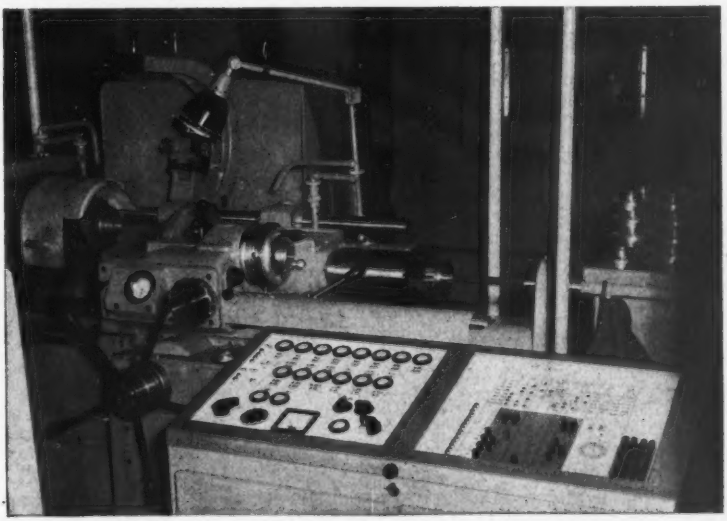


Fig. 3. A programme for automatic engagement of pre-set speeds and feeds, and reversal of the direction of spindle rotation, by means of electro-magnetic clutches, may be set up on this drum-type turret lathe

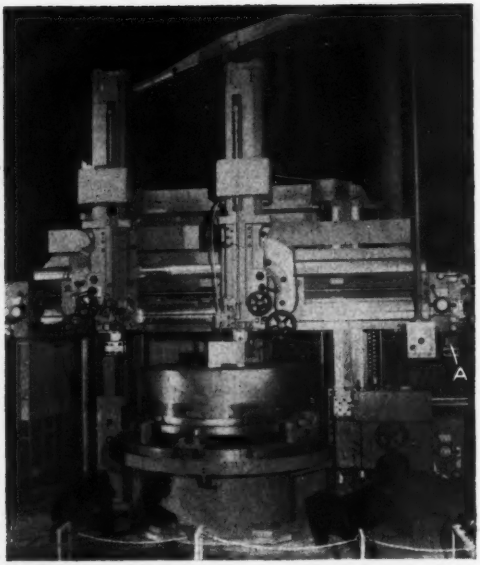


Fig. 4. Features of this vertical boring mill include a television camera on the right-hand tool-slide, with a closed circuit to the small screen *A*. The operator can thus observe the cutting action from his normal position

VERTICAL BORING MILL WITH TELEVISION SYSTEM

To assist the operator in controlling boring operations on large workpieces, the type DKZS 2,500 by 1,250 vertical boring mill, shown in Fig. 4, was fitted with a small television camera. The picture transmitted from this camera through a closed circuit cable is viewed on a small screen *A*, at the extreme right-hand end of the cross-rail, in a position adjacent to the controls. Built by VEB Grossdrehmaschinenbau "7 October," Berlin-Weissensee, Gehring-Str 39, this machine, again, is the second smallest of four sizes, and is designed to turn parts up to 8 ft. 2 in. diameter without the side head, or 7 ft. 8 in. with the side head, and up to 4 ft. 2 in. in height.

Special versions of the machine can be supplied for turning greater heights, up to 6 ft. 6 in. The table diameter is 7 ft. 4 in., and there is a choice of 18 speeds from 1 to 50 r.p.m., drive being taken from a 40 h.p. motor. On the two larger machines, with table diameters of 11 ft. 6 in., and 17 ft. 4 in., speeds range from 0·7 to 28, and 0·35 to 15 r.p.m., and are steplessly variable. Tool slide feeds range from 0·0016 to 0·248 in. per rev., in 12 steps, and power traverse for the cross-rail is at the rate of 14 in. per min. Rapid traverse of the tool-slides is also available, at 4 ft. per min., under push-button control.

Special attachments enable threading operations to be performed with the right-hand tool-holder on the cross-rail, and taper-turning to be carried out with the left-hand slide. The machine weighs approximately 33 tons.

UNIT CONSTRUCTION APPLIED TO DRILLING MACHINES

Standardization to permit the use of unit construction is readily applied to drilling machines, and further evidence was afforded this year of the results of work which has been in progress for some time. A typical machine incorporating standard units is the special, indexing table type shown in Fig. 5, which was exhibited by VEB Werkzeugmaschinenfabrik, Saalfeld, Ernst Thalmann-Str., 42-44.

This machine is provided with a standard column, fitted with a unit head which gives 9 spindle

Fig. 5. Standardized units including the column, spindle head, base, and indexing table, are incorporated in this special-purpose drilling and reaming machine. Only the multi-spindle adapter and the 5-position fixture were specially made

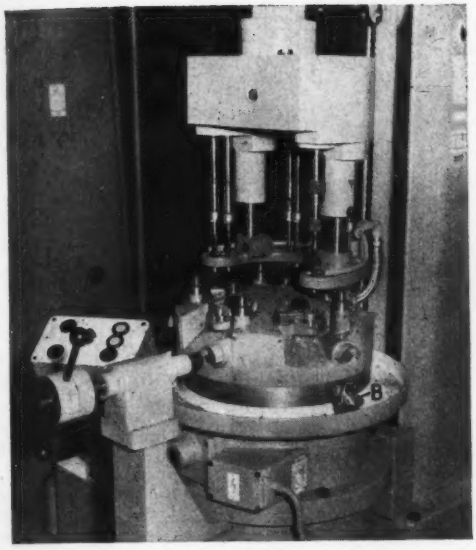


Fig. 6. In this close-up view of the machine in Fig. 5, can be seen details of the 5-position indexing work-support fixture

speeds, from 63 to 1,000 r.p.m., selected by levers. There is a choice of 9 feed rates, from 0·003 to 0·049 in. per rev., for the spindle, which is fitted with a special 7-spindle adapter for drilling, and semi-finish and finish reaming malleable iron bell crank levers.

Details of this attachment, also of the fixture, which is mounted on a type ETR 400 standard circular indexing table, of 15·75 in. diameter, are shown in the close-up view, Fig. 6, where one of the levers is indicated at *B*. A lever is loaded into V-locations at the front position of the 5-station table, and is secured by a single lever-type clamp, which is applied by a cam mechanism when the capstan unit, at the left, is advanced in order to engage the operating shaft.

A torque-limiting mechanism in the capstan mounting prevents the application of excessive clamping pressure. The table indexes to the left, and the machine operates on an automatic cycle which occupies 45 sec.

AUTOMATIC TRANSFER DRILLING MACHINE

The automatic 3-station transfer machine shown in Fig. 7 was also exhibited by the Saalfeld factory, and is intended for multiple drilling operations on gearboxes and cover plates of aluminium alloy, for tractors, also a steel flange. Gearbox castings, of rectangular form, will be delivered to the installation with the various faces machined. A close-up view of the loading position is given in Fig. 8, where a partly-finished casting is seen at the turn-over position, between the two drilling stations, which provides for chip disposal.

A casting is loaded on to the ways seen in the foreground, which have low side fences to provide for lateral location, and are pulled back into contact with two spring-loaded pawls *C*, which project upwards from the transfer carriage. This carriage is guided on V-surfaces between the transfer ways, and is moved by a hydraulic cylinder, the ram of which carries a rack with the teeth upwards. These teeth mesh with a pinion in a fixed position in the bed of the machine, and above this pinion there is another rack attached to the transfer carriage. Consequently, when the pinion is turned by the operation of the hydraulic cylinder, the transfer carriage is also moved.

The first transfer carriage is connected to a

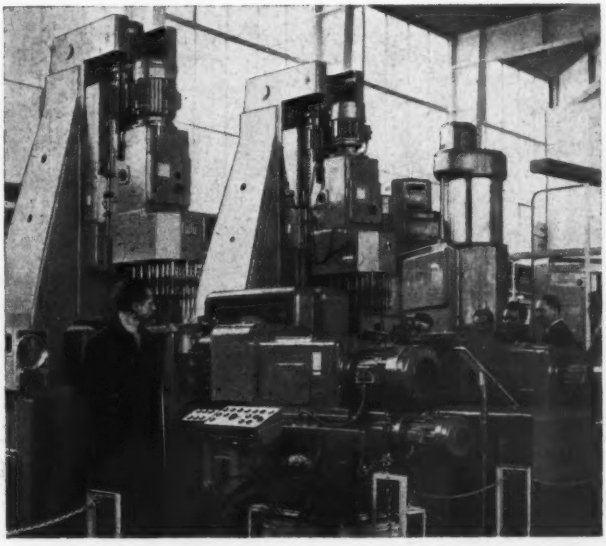


Fig. 7. General view of a 3-station transfer machine for drilling and tapping operations on cast aluminium tractor gearboxes, and on certain cover castings. Standard unit heads and other components are employed

Fig. 8. View of the loading position and the first machining station of the machine in Fig. 7, showing the hydraulically-operated double transfer carriage whereby the casting is moved to the drilling position and then to the turn-over unit

second, similar, carriage, by the member which carries the second rack, so that both move together, and a similar arrangement is provided on the far side of the turn-over unit, to move the casting to the tapping position, and subsequently out of the machine. At the first machining station, the casting is positioned by two fins with flat faces, which are raised after the previous casting has passed. It is pushed to one side, by a plunger, before the hydraulically-operated, lever-type, clamps on the bridge structure above are applied to the corners. These clamps are operated through long push rods from cylinders in the bed casting.

At the first station, the three heads drill a total of 76 holes, most of which are subsequently tapped to diameters from 0·236 to 1·26 in. Many of the drills are of the sub-land type, which is now being used increasingly in East Germany, and produce countersunk or counterbored holes. The unit heads are the EB 63 type from the range made by VEB Werkzeugmaschinenfabrik Vogtland, Plauen/Vogtland, Stresemann-Str., 92, and are fitted with 5- or 7-h.p. driving motors. When these heads are used for batch production of different components, the drive is taken through a 12-speed gearbox, which gives speeds from 22 to 2,000 r.p.m., and a motor - driven screw provides a choice of 14 feeds from 0·0009 to 1·98 in. per min., for drilling. Only one speed and feed combination is provided when the heads are incorporated in special machines, such as that shown.

Drilling completed, the casting is unclamped and moved into the turn-over unit, at the centre station of the machine, by the second transfer carriage, which returns before the unit is operated. The casting is then clamped, and turned through 180 deg. to allow chips to fall out into a

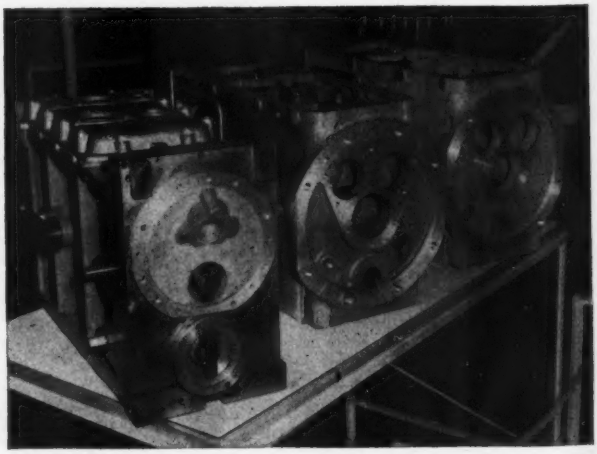


Fig. 9. Two examples (right) of the aluminium castings drilled and tapped on the machine in Fig. 7 and 8, and one of the jigs employed to hold cover castings for the gearbox, which are drilled on the same machine

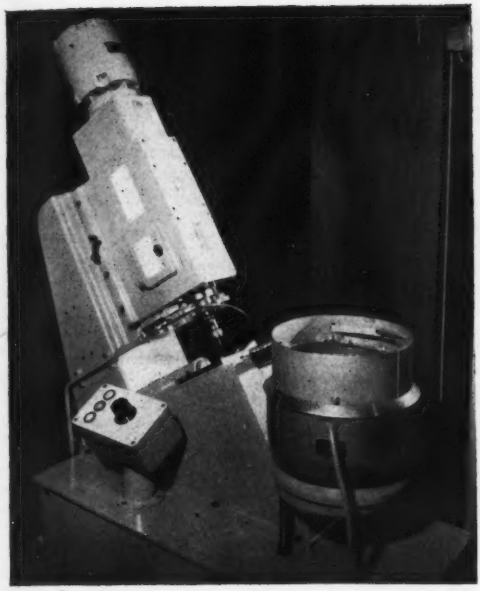


Fig. 10. On this GAI 8 automatic tapping machine, the spindle is driven at 710 r.p.m. by a 1-h.p. motor, and reversed by adjustable stops and switches inside the head

hopper beneath, leading to an Archimedean screw whereby the chips are discharged from the machine at one side. The circular housing in which the casting is inverted turns on rollers, and is moved by a hydraulic cylinder through rack and pinion. The oil supply to this cylinder is reversed at the end of the stroke and the casting is returned to the original position.

The first transfer carriage for the second, final station then moves the casting into the tapping position, where it is located and clamped in the manner previously described, and 73 holes are tapped and two are bored. The cycle time for drilling and tapping the 76 holes in three faces of the casting is 4 min. Two of the castings which are drilled and tapped on the machine are seen at the right in Fig. 9, and at the left is shown one of the jigs in which the cover castings and the steel flange, mentioned earlier, are carried through the machine. These castings and the flange are positioned by projections on their internal faces, and clamped by screws which are turned by means of detachable handles, to apply thrust through pivoted bars. The bars are held in slotted plungers, and they can be turned to allow the parts to be passed over them for loading and unloading. In these parts, some 60 holes are drilled at the first station, and 18 are tapped and three are bored at the tapping station, the jig being passed through the machine, located, and clamped, in the same manner as the gearbox casting.

AUTOMATIC TAPPING MACHINE

The automatic GAI 8 tapping machine shown in Fig. 10 was exhibited by VEB Werkzeugmaschinenfabrik Berggiesshubel, together with special equipment for tapping small copper contact clamps. It has a capacity for tapping holes up to about $\frac{3}{16}$ in. diameter in steel, and the spindle is driven by a motor of about 1 h.p., through an adjustable-torque transmission. This transmission provides for automatic reversal of the spindle should an undrilled workpiece be fed, or in the case of incorrect feeding, also if the maximum torque is exceeded during tapping for any reason. Reversal of the motor is effected by switches in the head.

This machine is supplied complete with the vibratory feed hopper shown, which is made by

Fig. 11. Close-up view showing details of the feeding arrangement on the small tapping machine

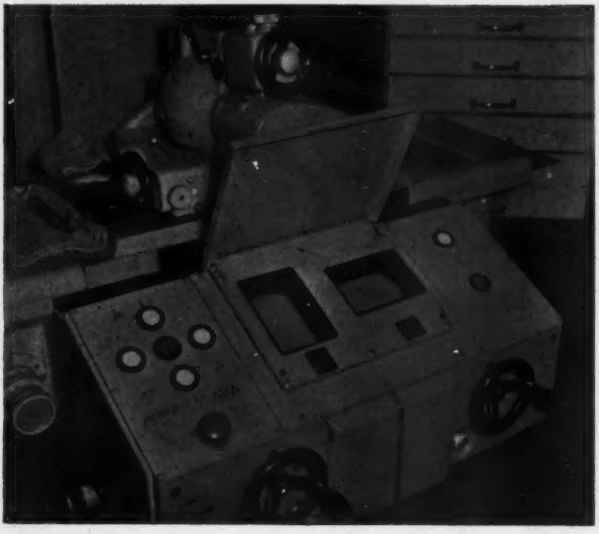


Fig. 12. Microscopes on the Mikromat BKoE 315 jig borer have now been replaced by projection screens which may be read more easily. The screens are covered by a sheet metal shield, when not in use

VEB Musterbau, Suhl, and can be fitted with any special chutes or other equipment for particular parts.

A view showing some of the copper contact clamps, and the method whereby they are fed beneath the tapping spindle is given in Fig. 11. The contact clamps progress up the inclined circular ramp in the normal manner until they pass a fence *D*. This fence is slightly above the level of the ramp, so that any clamp with the projection, in which the hole is to be tapped, in a horizontal position, can pass, others being pushed off the ramp, back into the hopper.

Clamps which pass the fence are aligned by a vertical surface, and pass down an inclined chute to the tapping position, where they are retained by the end of the lever *E*. This lever is mounted on a shaft which projects from the column carrying the tapping head and is turned each time the spindle is retracted. As the shaft turns, the lever *E* is lifted and allows the tapped clamp to move down, by gravity, out of the chute. The lever is then lowered, thereby serving to retain the next clamp in the line.

A tap of 0·196 in. diameter is employed for the clamp shown, and tapping is performed at the rate of 700 parts per hour, the spindle being driven by the reversible motor at 710 r.p.m.

MODIFIED MEASURING SYSTEM ON JIG BORER

The BKoE 315 jig borer shown by VEB Mikromat, Dresden, A 36, Mugelner-Str., 20, was equipped with a modified measuring system, developed in conjunction with VEB Carl Zeiss, Jena. As briefly described in MACHINERY, 97/21—6/7/60, when the machine was shown at Olympia, the measuring system includes precision glass scales, secured to the under-sides of the table and the saddle. These scales are viewed by transmitted light which also passes through glass discs engraved with numbers. The discs are so connected that they are turned when the saddle and table are moved, and the engraved numbers are so arranged that their images are synchronized with those of the 1-mm. (or 0·05-in.) graduations on the scales, when viewed on two screens at the front of the machine, as may be seen in Fig. 12.

The discs can also be turned, by means of slipping, toothed wheels, relative to the scales. In consequence, it is possible to set any graduation opposite any number, and the boring of holes to co-ordinate dimensions is thus facilitated. The two screens at the front of the machine, which are normally protected by the cover seen raised in Fig. 12, also show images of so-called spiral microscopes. Each of these "microscopes" comprises a glass disc engraved with a double spiral line and a series of divisions representing 0·001 mm. (or 0·0001 in.). The discs can be turned independently of the measuring system, and provide fine adjustment of the table or saddle positions.

For the final setting, the disc is turned to the position corresponding to the decimal portion of the required dimension and the scale division image is centred between the spiral lines. It is stated that with this arrangement positioning can be obtained to 0·002 mm. (0·00008 in.). The table and saddle of this machine move on V-and-flat, roller bearing ways, and are traversed by means of racks and pinions. Feeds for milling operations can now be applied to the table of the BKoE 315 machine in both directions of travel.

Information relating to the export of the East German machine tools described in this article can be obtained from WMW-Export, Berlin W 8, Mohrenstrasse 60/61, E. Germany.

Spring Strip Preparation and Spring Manufacture

By S. C. POULSEN, Associate Editor

E. A. KNIGHT & SONS, LTD., Station Close, Potters Bar, Middlesex, are specialist stockists of all types of strip material for the manufacture of high-grade springs, the production of which they also undertake. Some 100 tons of these materials, comprising cold rolled carbon steel, stainless steel, and beryllium copper, are regularly stocked in a wide range of grades, widths, and thicknesses, and when necessary, are sheared to specified widths, to meet customers' requirements. The various grades of cold rolled carbon spring steel include hardened and tempered; bright annealed; unhardened "as-rolled"; and hardened, tempered and polished watch main-spring steel. According to the grade, these materials are supplied in thicknesses of 0·001 in. to 0·093 in., and widths of 0·034 in. to 8 in. Stainless steel is also available in several grades, in thicknesses from 0·002 in. to 0·064 in., and widths from 0·032 in. to 12 in. A high proportion of these materials is from Swedish mills, where small batch quantity melting is carried out to permit the necessary close control of quality.

Telcon Cu-Be 250 beryllium copper (Telcon Metals, Ltd.) is stocked by arrangement with the sole distributors for the U.K., Beryllium & Copper Alloys, Ltd., in thicknesses from 0·002 in. to 0·048 in., and widths from 0·034 in. to 6 in. This material is in the half-hard condition, in which it is readily blanked, pierced and formed. Subsequently, it can be heat-treated to give hardness and tensile properties comparable with those of steel, which, in conjunction with good resistance to corrosion and fatigue, render it suitable for a wide variety of spring applications. Since it is non-magnetic and non-sparking, it also finds application in electrical equipment. Typically, hardening is carried out by heating the material to 315 to 320 deg. C., for one to two hours—preferably in a salt-bath—followed by quenching in water or air. This treatment gives a hardness value of 350 to 420, V.P.N., and a tensile strength of 75 to 80 tons per sq. in. Softening is effected by heating at 790 to 820 deg. C., for 10 to 30 min., followed by rapid quenching in water.

The company's activities in connection with the stocking and preparation of spring strip material, and the production of special springs for various branches of light engineering, are complementary to those of an associated company—Sterling Springs, Ltd.—who share the facilities of the same factory. The latter company manufacture and stock watch main-springs for the horological trade, in nearly 800 different sizes, suitable for more than 2,000 different designs of watch movements.

For any given material, the torque of a typical coil spring varies as the cube of the thickness, and is directly related to the width. Consequently, on all strip material for precision instrument springs, close tolerances must be maintained on thickness. For example, on the Swedish hardened, tempered and polished watch main-spring steel, in thicknesses of 0·0024 in. to 0·0039 in., the thickness tolerance is ±0·0001 in. Similarly, since

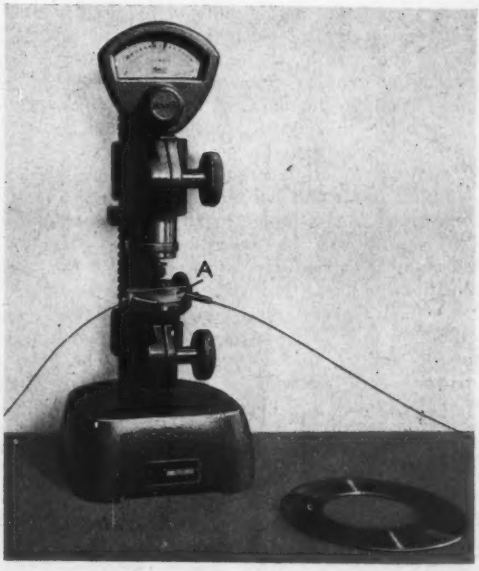


Fig. 1. This Mercer Abramson comparator, used for checking the thickness of strip stock, can be read directly to 0·0005 mm. (0·00002 in.)

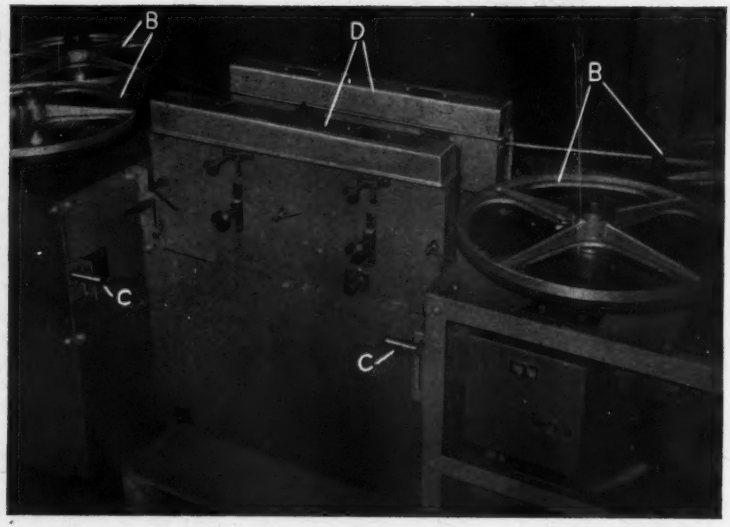


Fig. 2. This double-sided special-purpose machine, designed and built by E. A. Knight & Sons, Ltd., is employed for edge-grinding coiled strip

working stresses of the order of 100 tons per sq. in. are common, high-quality of material is essential, and it is frequently necessary to grind, or grind and polish, the edges of the strip, as a precaution against cracking in service. For the same reasons, the material must be as consistent as possible in physical properties, and must be correctly heat-treated.

Samples of all incoming material are checked for dimensions and hardness, and torque tests are performed on sample batches of the finished springs, as will be described later. Thickness checking is carried out with the Mercer Abramson comparator shown in Fig. 1, the dial-type indicator of which can be read directly to 0·0005 mm. (0·00002 in.). This instrument is set with the aid of slip-gauges, and to facilitate the checking of narrow strip material, it is equipped with the parallel guides *A*. These guides are adjustable to suit the width of the strip, and enable it to be drawn continuously beneath the contact-tip of the instrument, so that any variation in thickness can be detected.

The shearing of strip stock into narrower widths is carried out on gang slitting machines of conventional design. High speed steel slitting discs are employed, which are kept as sharp as possible to ensure that the material is sheared cleanly, and the widths of the discs are held within ±0·0001 in. The minimum sheared-width capacities of the various machines installed in the factory range from ¼ in. to $\frac{1}{32}$ in. and the maximum initial-width capacity is 15 in. Very narrow strip, it is pointed out, can only be cut in the thinner materials, since it is impractical to slit to a widtn less than five times the thickness.

To facilitate grinding the edges of spring strip material, from 0·1 to 1¼ in. wide, to a radiused form, the company has designed and built the special-purpose machine shown in Fig. 2, which will accommodate coils up to 24 in. diameter. As may be observed, to provide for grinding the strip first on one edge, and then on the other, it is of double-sided construction. Each "side" is equipped with a pair of spools *B*, either of which may be power driven, or allowed to rotate idly, by the engagement or disengagement of an associated manually-operated clutch. These clutches are actuated by means of the handles *C*, and each spool is provided with a friction braking device, to prevent over-run when it is rotating idly.

By these means, the strip may be drawn through the housing *D*, in either direction, so that the lower edge passes over a set of profiled grinding wheels enclosed in the housing. Suitable guides ensure that vertical and lateral alignment of the strip, in relation to the wheels, is maintained. The electric motors that drive the wheels are arranged between the two housings *D*, and each motor has a double-ended shaft, on each end of which a wheel is directly mounted.

With this arrangement, the same motors serve to drive the wheels in both housings. Grinding can be carried out in any required number of passes, in alternate directions, and when the strip has been ground on one edge, the coil is turned over and transferred to the other side, for completion of the second edge. The two sides, it may be noted, can be operated together or independently, so that, if required, two coils of strip can be ground simultaneously. Narrower strip, down to 0·040 in. wide, is ground on another, similar machine, which is arranged vertically.

EDGE-POLISHING

As already indicated, the edges of certain grades of strip are polished as well as ground. Polishing is carried out on the Swiss machine shown in Fig. 3, which will accommodate material up to $\frac{5}{8}$-in. wide. A coiling spool is provided at each end, which can be power driven, or released to rotate freely, so that the material can be passed through the machine in either direction. The strip is drawn between guide-rollers that serve to locate it in relation to a series of abrasive bands *E*, which are held against the edges by the curved pads *F*. Each of these pads is thrust against the back of the band by a pivoted member *G*, and the force applied is adjustable by means of a weight, as at *H*. In Fig. 3, it may be noted, the arms that carry the weights are seen temporarily, raised by the bar *J*, to withdraw the abrasive bands from the edges of the strip, while the latter is re-coiled at the input end in preparation for the next working pass.

There are eight pairs of abrasive bands, which are of successively finer grades towards the output end of the machine, to provide for a progressive polishing action. When the machine is operating normally, each band and associated pad is periodically and momentarily withdrawn by the action of a cam *K*. During each withdrawal, another cam on the same shaft actuates the feed-pawl *L*, to turn the upper spool *M* through a small angle, and thus advance the abrasive band from the lower to the upper spool. The member *G* is then released, so that the band is again pressed against the work.

In this way, worn abrasive surface is repeatedly replaced by fresh, to maintain cutting efficiency and ensure that the work is polished uniformly. The cams are so arranged that only one band is withdrawn at a time. As indicated above, after each working pass, the strip is recoiled at the input end, and passed through the machine again. Polishing is continued in this manner until the required standard of finish is obtained. Watch-spring steel, for example, may require as many as 20 passes. This machine is also employed for edge-polishing stainless steel, and when it is used for this purpose, fibre guide-rollers are substituted for the normal steel rollers, to avoid scoring the surfaces of the strip. Other equipment available at the

Fig. 4. Simple hand-operated mandrels, of the design here shown, are used in the production of watch and other types of coiled springs

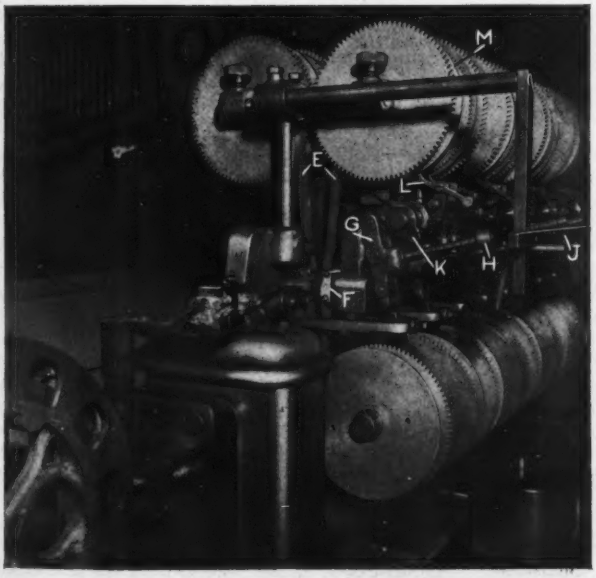


Fig. 3. On this Swiss automatic machine, strip spring-steel stock is polished on both edges simultaneously, by a series of narrow abrasive bands

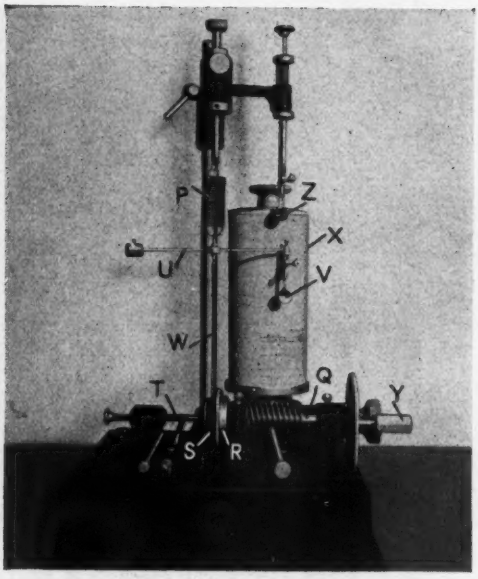


Fig. 5. Samples of all coil springs produced are torque-tested against a standard reference spring *P*, on this small Swiss machine

factory, it may be noted, includes a special-purpose machine for surface-polishing stainless steel strip.

SPRING PRODUCTION

In the spring-making section of the factory, the same equipment and skilled girl operators perform work for both companies. Thus, a number of small hand- and pedal-operated presses used for the production of special springs for E. A. Knight, Ltd., is also employed for preliminary operations, such as cropping, piercing and riveting, on the watch-springs manufactured by Sterling Springs, Ltd., Similarly, simple coiling mandrels, used mainly by the latter company for watch-springs, are available to the former, for producing special coil-springs. This policy of sharing also covers heat-treatment plant, and the joint specialized experience of the two firms in their respective fields.

Since the majority of the special springs are required in limited batch quantities only, the tools employed for this work on the small hand- and pedal-operated presses mentioned are of simple, economical design. In preference to follow-on tools, therefore, multi-station tools, on which the various operations are performed individually, are used wherever possible. For the production of watch- and other high-grade coil springs, skilled hand methods, in the firm's experience, are superior to purely mechanical arrangements. All such springs are therefore wound with the aid of simple equipment of the design shown in Fig. 4.

As may be observed, this equipment comprises an inclined plate mounted on the bench-top. In the centre of the plate, there is a winding mandrel, which is driven by the large pinion *N*. This pinion has a handle, whereby it is rotated manually, and the ratio is such that the mandrel rotates several times for each revolution of the pinion. A length of spring strip, with the ends previously prepared, is engaged with the mandrel, which is then rotated. Meanwhile, the form into which the coil is set, is controlled by carefully-regulated finger-pressure. By these means, the operator is able to produce the springs accurately and consistently.

In preparation for the blueing heat-treatment that follows the winding of carbon-steel springs, the work is thoroughly cleaned with trichlor-ethylene, to remove all grease and finger-marks. It is then heated in air, at 240 deg. C. to 250 deg. C., for a minimum of one hour, in an electric oven. This treatment, from which the work emerges with a uniform lustrous coloured finish, serves as a stress-relieving process, to stabilize the shape of the coil, and also imparts a useful degree of corrosion-resistance. Conventional coil springs are blued in the free condition, whereas reverse-coil springs are first wound into annular "keepers", and after heat-treatment, are reverse coiled by re-winding them in the opposite direction. Most stainless steel springs, it may be noted, are reverse coiled.

For the corresponding heat-treatment of coil-springs in certain grades of austenitic stainless steel, the work is very thoroughly cleaned and degreased, and is then held at 400 deg. C. for one to two hours, in an atmosphere of pure hydrogen. This treatment, which affords increases in tensile strength up to 15 tons per sq. in., is carried out in an A.E.W. electric oven. The interior of the oven is purged with a flow of hydrogen from a gas-bottle, for approximately one hour before the current is switched on, and this flow is maintained until the work and oven have cooled to room temperature, prior to unloading. Other heat-treatment equipment available at the factory includes a special oven, built by the company, for the continuous blueing of carbon steel strip.

As mentioned earlier, torque tests are performed on sample batches of all finished coil springs. These tests are carried out on the machine shown in Fig. 5 (Chs. Jaggi, Bienne, Switzerland), the

sample spring being checked against a tension-spring *P*, of known rating, which serves as a reference standard. An arbor of suitable diameter is mounted in a collet in the manually-rotated mandrel *Q*, and the sample spring is accommodated in the circular housing *R*. The winding drum *S* is held lightly in engagement with the arbor by the "tailstock" centre *T*, and is provided with a pin that engages the outer end of the sample spring.

A counterbalanced arm *U* is hung from the reference-spring, as seen, and carries a recording pen *V*. This arm is connected to the winding drum by the thread *W*, and the pen *V* is in contact with a paper chart carried on the drum *X*, which is rotated, through a worm-wheel, by the worm seen on the mandrel *Q*. Thus, when the mandrel is rotated by means of the handle *Y*, the sample spring is wound-up, and the torque results in a proportionate deflection of the reference-spring *P*, and a corresponding displacement of the pen *V*, on the moving chart. Meanwhile, a stationary pen, *Z*, records a horizontal datum-line, for reference purposes.

A typical chart produced on the machine is shown in Fig. 6, where the upper line represents the curve obtained when winding-up the spring, and the lower, that obtained when unwinding. The difference between the two is the result of frictional effects, and affords an indication of the efficiency. The sharp peak at *A* denotes the point at which the spring is fully wound, and the straight line *B*, the release of excess torque before it begins to unwind normally, at *C*. Vertical lines, as at *D*, indicate the number of turns, in multiples of four.

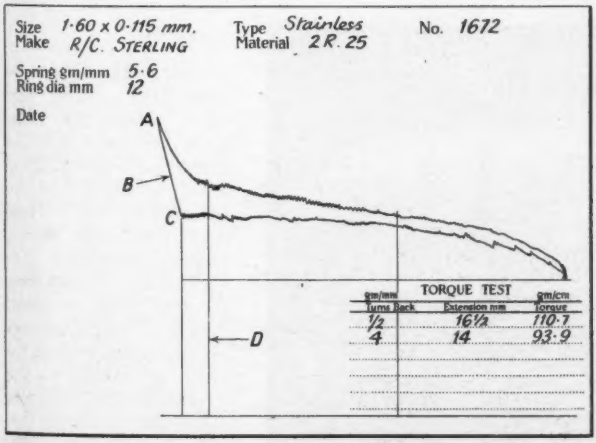


Fig. 6. Typical torque diagram obtained with the machine shown in Fig. 5. The distance between the upper and lower curves affords an indication of efficiency

Rubert Sliding-jaw Adjustable Spanner

Rubert & Co., Ltd., Acru Works, Demmings Road, Councillor Lane, Cheadle, Cheshire, have recently placed on the market the patented adjustable spanner shown in the accompanying figure.

The setting of the Rubert adjustable spanner is altered by sliding the moving jaw by means of a locking sleeve

A ball-ended stud, which is mounted on one edge of the body, engages a slot that extends along part of the abutting edge of the moving jaw, and thus serves to retain and guide the latter member.

Adjustment of the gap is effected by sliding the moving jaw, by the movement of a sleeve that encircles this jaw and the body and engages their outer edges. These edges diverge slightly towards the stationary jaw, and are inclined with respect to the direction of movement. The angle of inclination is such that pressure upon the working face of the moving jaw causes jamming, and the setting is thus retained. To facilitate setting, the moving jaw is lightly spring-loaded so that it is thrust towards the open position.

The spanner is being made in one size only at the present, which will accommodate nuts or boltheads up to ½-in. B.S.W.

Corthals Copying Attachments for Centre Lathes

Mr. E. J. H. Mills, 189 Park West, London, W.2, has recently been appointed United Kingdom representative for the range of hydraulic copying attachments made by Ateliers Francois Corthals, Brussels, Belgium. The attachments are available in two types, one of which is intended to be mounted on the front, and the other on the rear of the cross-slide, at an angle to the work. Designed for heavy-duty copying work, the front-mounted attachment shown in the figure can be supplied in five sizes, for use on lathes which have minimum distances of 2⅝ to 6⅝ in. between the work axis and the top face of the cross-slide. The rear-mounted attachment is normally employed for medium- and light-duty copy-turning operations, and is made in three sizes which can be applied to lathes with minimum distances of 2⅝, 3 and 4⅜ in. between the centre line of the work and the top of the cross-slide.

Maximum copying slide movements of 3, 3½, 4⅜, 4¾ and 4⅞ in. are afforded by the attachments of the front-mounted type, and of 2⅜, 3, and 4⅜ in. by those intended for mounting at the rear of the cross-slide. Both attachments may be used for copy-facing operations, and the largest size for rear mounting, designated type LDA, is specially designed for operation in conjunction with a rotating master, for copy-machining bottle moulds for example.

On each of the attachments in the range, the cutting tool is mounted in a holder which is secured to the copying slide, and settings for depth of cut are made by adjusting the stylus arm in relation to the template. With this arrangement, the need for a separate tool slide is avoided, and increased rigidity is obtained. The slide which carries the stylus arm is mounted on dovetail guideways on a swivel bracket, and can be adjusted for setting the depth of cut through a maximum distance of ¾ to 2⅜ in. depending on the size of the attachment, by means of a hand-wheel fitted with a vernier scale. In addition, the stylus arm can be adjusted in a direction parallel with the work axis, for a distance of ⅜ in., for setting the cutting tool in relation to the end of the workpiece. Rapid power traverse movements of the copying slide towards and away from the work are controlled by a conveniently-placed lever. On the attachment which is intended for mounting on the front of the cross-slide, the stylus arm assembly, and the pilot valve for controlling the supply of pressure fluid to the hydraulic operating cylinder, are carried below the copying slide, as shown. On the attachment for mounting on the rear of the cross-slide, this assembly is attached to the side of the copying slide, and the carrier for the template (or a cylindrical master) is positioned above and to the rear of the work axis. A self-contained hydraulic pump and reservoir unit is provided for the supply of pressure oil to these copy-turning attachments.

Corthals hydraulic copying attachment

THE TONNAGE OF MERCHANT SHIPS laid down (vessels of 1,600 gross tons and over) in 1960 was 910,000, of which 254,000 was for overseas owners. Tonnage completed during 1960 amounted to 1,242,000 (including 203,000 for overseas owners) and tonnage under construction at the end of the year, 1,547,000 (393,000). In 1959 the total for tonnage laid down was 1,091,000, and for tonnage completed, 1,321,000.

Recent Developments in Die Casting by the Alumasc Low-pressure Process

By R. E. GREEN, Associate Editor

THE LOW-PRESSURE PROCESS OF DIE CASTING aluminium alloys, operated by Alumasc, Ltd., Burton Latimer, Northamptonshire, was described in a series of articles in MACHINERY, 86/197—28/1/55, 86/425—25/2/55 and 86/1157—27/5/55. At that time, the method was being employed, for example, for casting motor car and other power unit housings, pistons, beer casks of capacities up to 54 gallons, radiators, rainwater goods, and components for agricultural machinery, looms, and food mixers. With this process, which was developed by the present managing director, Mr. E. C. Lewis, A.M.I.M.E., the die is mounted over a crucible, or "copper", as it is termed.

A refractory-lined tube, known as the "stalk", extends down into the molten metal in the copper, to which heat is applied externally, and with the die closed, low pressure air, at between 2 and 10 lb. per sq. in., is admitted to the copper. This air acts on the surface of the melt, forcing it downwards, and metal is thus caused to rise up the stalk and enter the die. After sufficient time has elapsed for the casting to solidify, the pressure is released and the still-molten metal in the stalk runs back into the copper. The die is then opened and the casting extracted. Because of the slow rate at which the metal enters the die, air is not trapped, and since the pressure is maintained during solidification there is no need to provide risers.

Since the series of articles mentioned above was prepared, the foundry has been re-roofed and extended, and new type ventilators of large capacity have been fitted. For bulk melting, formerly carried out in ½-ton capacity, oil-fired, semi-rotary furnaces, designed and made by the company, five Sklenar units of slightly larger capacity have been installed, one of which is seen at the right in the general view of the foundry extension given in Fig. 1. Arrangements for handling the bulk-melted metal have also been considerably improved by the installation of the overhead rails seen at the left in Fig. 1, along which wheeled carriers for the 100-lb. capacity ladles employed for charging the individual coppers can be traversed for the length of the foundry.

Fig. 1. A general view of the extension to the foundry of Alumasc, Ltd., Burton Latimer, showing one of the Sklenar bulk melting furnaces at the right, and the monorail whereby molten metal is transported to the casting furnaces

Above each casting installation there is a travelling hoist whereby the ladle can be moved close to the copper for the re-charging operation, which is performed by way of an opening in the furnace shroud. The hoists are also employed for die changing operations, many of the dies being of considerable weight. In addition to the extension of the foundry, which has been increased in size by one third, the toolroom has been enlarged, a second storey has been added to the main office building to provide for a new development and drawing office, other offices have been added, and a new building has been erected for garaging, vehicle servicing, and die storage.

An important development, in 1957, was the design, in conjunction with Wild-Barfield Electric Furnaces, Ltd., of an electric induction furnace, to replace the gas-fired type originally made by the company and described in the first of the articles mentioned above. A drawing of one of the new furnaces, partly in section, is shown in Fig. 2, and it will be seen that the refractory-lined, cast-iron stalk *A* projects almost to the bottom of the crucible *B*. This furnace has a rating of 25 kW., and the molten metal is retained in the plumbago crucible, which has a capacity of 200 lb. of aluminium, and is of the the bottom, and is supplied by the Morgan Crucible Co., Ltd. The crucible rests on a pad of plumbago (not shown) at the bottom, and is supported by the walls of the cast iron copper *C*, which stands on four feet.

At *D* may be seen the pyrometer sheath whereby measurements of the temperature of the cast-iron copper are obtained. The copper is surrounded by magnesium oxide insulation, and outside this insulation are mounted induction heating coils, for which the cast iron copper serves as a core.

The lid, to which the die unit is attached when the furnace is in use, is sealed to the flange of the copper with a ring of heat-resistant asbestos. Pro-

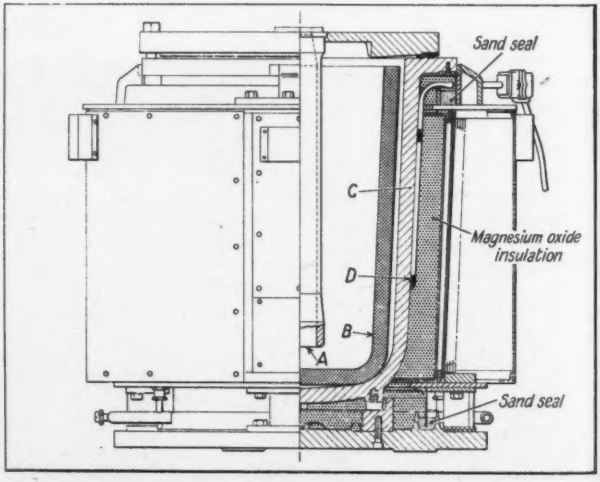


Fig. 2. Part-sectional drawing of the new mains-frequency heated furnace developed by Alumasc, Ltd., in conjunction with Wild-Barfield Electric Furnaces, Ltd.

vision is made in the copper casting for the entry of a pyrometer to measure the temperature of the molten metal, which is thermostatically controlled, and a cored projection (not shown) at one side, fitted with a screwed plug, provides for filling from the bulk-melted supply. There is also an entry hole in the wall of the copper for the low pressure air whereby the metal is forced up the stalk into the die cavity.

Since this design of furnace was introduced, the company has followed a policy of steadily replacing those of the gas-fired type, and a row of the new furnaces, installed in the older part of the foundry, is seen in the heading illustration. The plumbago crucibles have a life of more than six months under conditions of continuous heating, the metal being kept in a semi-molten state during the night by a low setting of the temperature controller on each furnace. This arrangement has the advantage that work can be restarted very quickly when the foundry opens in the morning, without the need for prior lighting of oil- or gas-burning furnaces. The cast iron copper of each furnace has an indeterminate life, which is affected by the weight of the die and the pressure used in casting, among other factors.

In addition to the new design of furnace, the company has introduced a semi-automatic unit for controlling the casting cycle, so that the operator is not required to watch the sweep-second hand of the clock formerly employed for timing the solidification period for each casting. One of these units is seen in Fig. 3, and it comprises a number of pressure-reducing and other pneumatic valves (by Broom & Wade, Ltd., and Benton & Stone, Ltd.), and a Venner timing unit, mounted on a panel. Air from the mains, at a pressure of 40 lb. per sq. in., is connected to the inlet side of the four-way valve *E*, which is controlled by the solenoid at the left-hand end.

The panel is energized by means of the mains switch *F*, and in the event of an electrical fault the supply can be cut off. In such circumstances, the equipment can be operated manually. After the die has been closed, the solenoid valve *E* is operated by a push-button at the centre of the electrical timer, and this action also starts the timer.

Air is then directed to the pressure-reducing valve *G*, which is set to give the desired pressure—

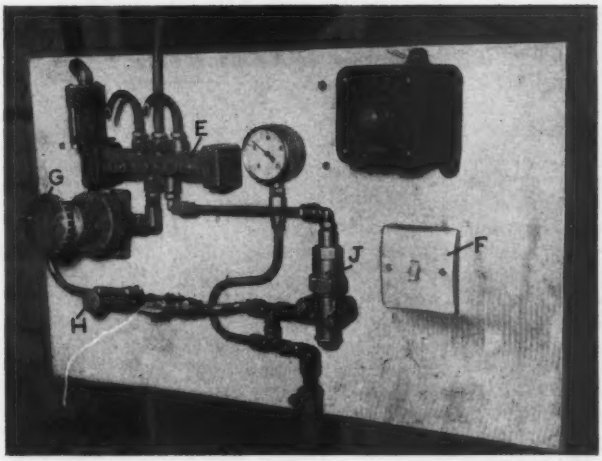


Fig. 3. This arrangement of pressure-reducing and flow-control valves, pressure gauge, and electric timer, on a standard panel, is now employed for controlling the air supply, pressure, and duration of the casting cycle for the Alumasc process

of 2 to 10 lb. per sq. in. This air passes through a variable-flow valve *H*, and a plain gas cock, to a four-way connector, one arm of which is coupled to a pressure gauge, whereby the pressure in use is shown. From the connecter, the air is led to the interior of the copper, causing the metal to rise and fill the die cavity, and after the solidification period has elapsed, the timer runs down.

As a result, the setting of the solenoid valve *E* is reversed, to cut off the air supply to the copper and direct air at mains pressure to the spring-loaded plunger of the exhaust valve *J*, one side of which is thus opened to atmosphere. The air within the copper can now escape through this exhaust valve, and the molten metal in the stalk flows back into the crucible, leaving only a small sprue on the casting surface. The timer can be set for any period up to 15 min, which is suitable for all the dies employed in the foundry.

EQUIPMENT FOR PRODUCING LOW-PRESSURE DIE CASTINGS

Reference has already been made in MACHINERY, 96/308—10/2/60, to the 6-cylinder engine crankcase and gearbox castings for the Chevrolet Corvair car, the dies for which were designed by Alumasc, Ltd. Another intricate casting for an internal combustion engine application is a 2-choke carburetter body seen in two positions in Fig. 4, together with the die in which it is made. The casting at

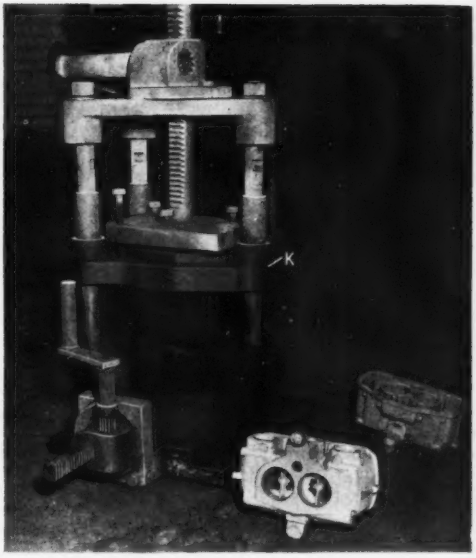


Fig. 4. Typical of those employed in the Alumasc low-pressure die casting process, this die produces the 2-choke carburetter body castings seen at the right in the illustration

the rear is in the position that it occupied in the die, with the opening upwards, and the interior is cored by the main moving member of the die, which is moved vertically by rack and pinion.

A stripper plate *K*, forms the top surface of the outer wall of the casting, and after the die has been opened and the upper core raised, the upward movement of this plate is arrested by tubes which are loose on the three vertical support pillars. With further upward movement, the core is then stripped from the casting. The side faces of the casting, which are of intricate form, are shaped by cavities and projections on the inner faces of the horizontal cores at the front and rear of the die. Two cores project upwards from the lower die member to form the lower ends of the two choke tubes and to form the bridge pieces in which the jets are subsequently mounted.

The casting measures about 8 by 5 by 3½ in., and the choke tube diameter is 2 in. Made from L.M. 4 material, containing 4 to 6 per cent of silicon, the casting weighs about 3 lb. 12 oz. In the die, metal is fed through runner channels in the bottom plate so that it enters the cavity at two positions, and the sprues are removed on a bandsaw at the fettling stage. The number of such castings required, although not sufficient to warrant the cost of a pressure die casting die, was ample to justify the construction of the die shown. As compared with sand casting, it may be noted, production with this die shows a saving for a quantity of 2,000 or more. Die costs are considerably reduced by the use of standardized rack and pinion units, and other mechanical parts in their designs.

INSTRUMENT CASING DIE

The instrument casing seen in Fig. 5, which measures about 16 by 5½ by 3 in., is cast in L.M. 6 material, and weighs 4 lb. 6 oz. Outside surfaces of the casting are at right angles to the base, no draft being permitted, but the normal amount of draft is provided inside, to assist in stripping the casting from the core. Each of the six internal strengthening ribs tapers from $\frac{5}{8}$ to $\frac{3}{4}$ in. over the length of 3 in.

A view of the die in which this casting is made is given in Fig. 6, and it will be seen that the large internal core is moved vertically by a double rack and pinion arrangement, carried on a cast plate which is supported above the die by four posts. The die members whereby the external side faces of the casting are formed are suspended from brackets on the outside of the stripper plate surrounding the core, which is guided

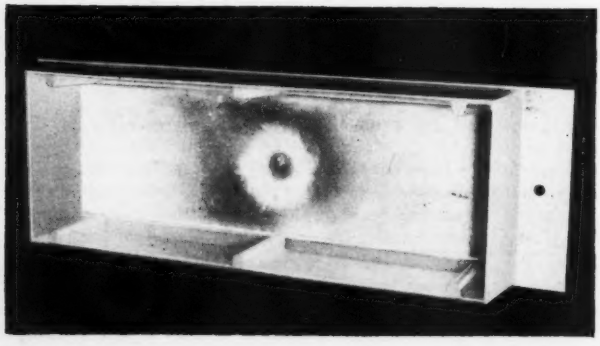


Fig. 5. This box casting, measuring 16 by 5½ by 3 in., for an instrument, is required to have external walls without draft. The position of the central sprue is indicated by the marks inside the body of the casting

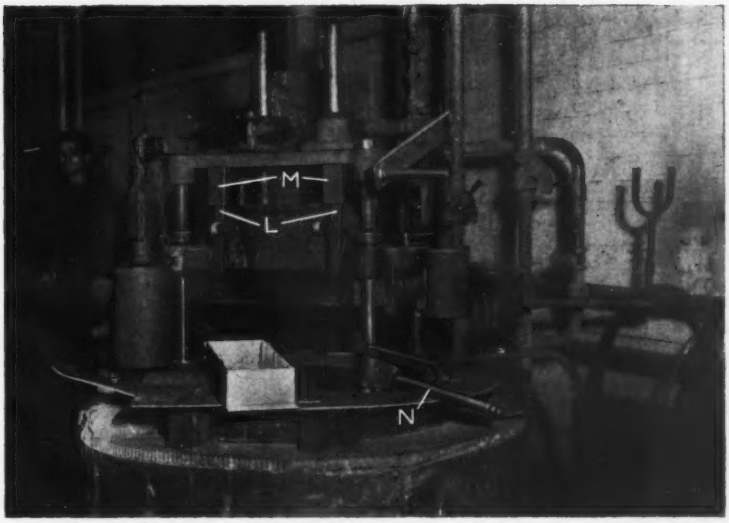


Fig. 6. View of the die employed for the box casting in Fig. 5. The straight external walls are produced by pivoted side and end plates which are locked in the casting position by rebates in the lower die member

on the four support posts. As the core is raised to the position shown, to remove the casting, the upper ends of the levers *L*, to which the side die members are attached, are brought into contact with cam surfaces on the inner sides of wedge-shaped projections *M*, attached to the top plate of the die.

The arrangement is similar at the rear of the die, and as the core is raised the side members are pivoted outwards, away from the casting. The end members of the die are also pivoted, and are swung to and from the vertical position by means of screw-jacks on the stripper plate. When the die is closed, the pivoted side and end plates are held in place by rebates in the lower member, which receive the edges, and by projections which extend below the plates. After the die has been closed, in preparation for making a casting, quick-acting, cam-type jacks, one of which is seen at *N*, are placed between the core and the top plate of the die, and tightened, to take the upward thrust exerted by the metal.

Air is then admitted to the copper by means of one of the control units described earlier, at a pressure of 2½ lb. per sq. in., and the timing unit is set to maintain this pressure for 2 min. 15 sec. The metal enters the die through a single sprue of ⅞ in. diameter, and during the solidification period an air pipe is inserted in a hole in the main core, immediately above the sprue. Air emerging from this pipe assists in cooling the core in the area of the sprue, to ensure that when the air supply to the copper is turned off, and the metal runs back down the

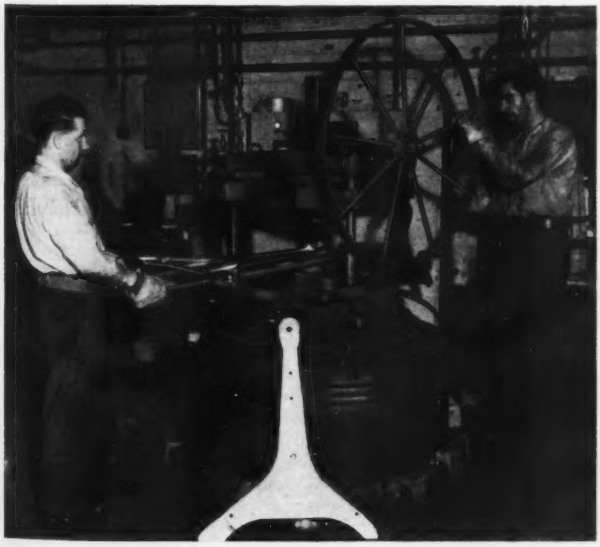


Fig. 7. In this die, for the end frame casting of an Admel Paramount draughting stand, as seen in the foreground, three loose cores are employed. It is mounted on a 700-lb. capacity furnace

stalk, a slight projection will be formed on the casting at the sprue position, rather than a hollow. This projection is easily removed during fettling, and practically no other work is required to finish the casting.

After the expiry of the die-filling and solidification period quoted, the air pressure is turned off and the cam jacks are removed. The inner core and stripper plate are then raised by means of the rack and pinion arrangement, and a flat plate is placed in the die to catch the casting when it is stripped, thus protecting it from damage. As the stripper plate approaches the position shown, the side and end plates of the die are released from the rebates in the lower member, and the operator unscrews the jacks at the sides to retract the end plates.

Subsequently, the side plates are automatically swung outwards, and the core is stripped from the casting. The U-shaped tube at the extreme right in Fig. 6 is a 2-nozzle bunsen burner for die-heating purposes, and can be swung into position to play on the die when required.

A die for producing end frame castings for the Admel Paramount draughting machine stand, as seen in the foreground, is shown in the open position in Feg. 7. This casting is about 36 in. high by 29 in. across the feet, weighs 9 lb. 8 oz., has a wall thickness of ¼ in., and is made from L.M. 6 alloy, the die filling and solidification time being 2 min.

A furnace of the new type described, of 700 lb. capacity, is employed with the die, which has a fixed lower and a moving upper member, with a single rack and pinion for closing and opening. The upper end of the casting has a circular recess, of 3½ in. diameter by 1¼ in. deep, for the trunnion bearing of the drawing board, and this recess is formed by a loose core.

Two other loose cores are employed to produce small holes in the feet of the casting, and are secured in place by toggle clamps. The metal in the furnace is held at a temperature of 720 deg. C, and it enters the die cavity at a pressure of 2 lb. per sq. in., through a single sprue located approximately at the centre of gravity of the casting. The upper die member is again cooled above the sprue by an air blast to ensure the formation of a raised surface, rather than a recess, at this point.

Developments in the Pressure Die Casting of Steel

By V. M. BELOV and S. A. KAZENNOV*

THE PRESSURE DIE CASTING process is currently limited to the alloys of zinc, aluminium, and magnesium, and some brasses. Technical difficulties arise if the die casting of alloys of higher melting point is attempted. Recent work, however, has indicated the lines of development that must be followed if the pressure die casting of steel is to become a practical possibility.

Owing to the higher melting point, and the different mechanical and physical properties of steel as compared with the die casting alloys now in industrial use, specific limitations are imposed in connection with casting design. Because service conditions are severe, die life is short and the design of the part must be such as to enable the die to be made by a low labour- and material-cost process such as hobbing. On account of the large thermal contraction of steel, high stresses may be set up in the component unless adequate draft is allowed. Draft of 1 deg. is necessary on side walls where there is likely to be severe contraction, and 0·5 deg. elsewhere.

The solidifying steel contracts around cores and projecting portions of the cavity and grips them tightly, and the force needed for ejection may reach tens of tons. As a result, surfaces normal to the die face quickly become worn at points where contraction is constrained. The corresponding casting dimensions may thus be altered, and this fact must be taken into account when setting tolerances. Holes of less than about 0·3 in. diameter should not be cored.

Castings should be so designed that the major part of the cast surface does not require to be machined. Where the gate joins the casting, on location faces, and at ejector pin positions, an allowance of 0·008/0·012 in. for grinding, or 0·020/0·040 in. for machining, should be made. Walls of steel pressure die castings should be not less than 0·080 in. thick, and should be uniform or—if varying—arranged so that the thickening section follows the solidification gradient. With this arrangement, the thickest section adjoins the gate. It is impracticable to produce castings with localized heavy sections free from shrinkage defects. Both finish and dimensional accuracy deteriorate as the die becomes worn.

Not all steels are equally suitable for pressure die casting. In particular, steels with 0·2 per cent C. are subject to cracking during solidification. The steels most suitable for the process are those with carbon contents up to 0·15 per cent, and with good plastic properties both when hot and when

* An abridged translation from *Liteinoe Proizvodstvo* No 10, 1959.

TABLE 1. RELATION BETWEEN CASTING THICKNESS AND HARDNESS OF "AS-CAST" TEST PIECE OF VARIOUS PRESSURE DIE CAST STEELS

Thickness of Test Piece, in.	Brinell Hardness			
	Steel 20	Steel 30	Steel 40	Steel 50
0·08	220	250	280	420
0·16	180	190	200	260
0·32	170	180	190	220

cold. Some alloy steels, including the chromium-nickel types, have good plastic properties and a low solidification shrinkage.

Steel pressure die castings are hardened by rapid chilling in the die, and the "as-cast" hardness increases with carbon content. This effect is shown in Table 1, which also indicates the inverse relation between section thickness and hardness. Similar results are obtained with alloy steels. The rates at which the die becomes worn and the shot-sleeve abraded at the forward end, are largely determined by the as-cast hardness of the component. From an operational viewpoint, therefore, the most suitable steels for pressure die casting are non-hardenable types with 0·15/0·2 per cent carbon content, austenitic steels of low hardenability, and special alloy steels of low final hardness. In selecting a steel, it is also necessary to take into account the tendency to oxidize when molten, which can result in off-grade castings and surface imperfections.

DIE DESIGN

To offset the limited die life, die production must be cheapened by using quickly replaceable die blocks, by maximum standardization of all die components, and by hobbing the die cavities. A typical die for casting steel consists of two main members and an ejector mechanism, as seen in Fig. 1, the core portion being formed integrally with the fixed member and the cavity sunk directly in the moving member. Separate cavity inserts are not satisfactory, as the molten steel penetrates the joints between insert and block and causes early failure. Standard die blocks are used, which are capable of producing a variety of components within a given size range, and worn die members can be changed in about 10 min. Ejector pin replacement requires 5 to 7 min. Ejector housings are subject to rapid wear, and provision must be made for periodically drilling them oversize and fitting larger diameter pins.

DIE LAYOUT

The high melting point of steel, and the large solidification shrinkage, are the main factors which determine the positioning of the cavity in the die, the form and size of the runners, and the size and location of overflows. Casting temperature is appreciably above the liquidus, and the molten metal enters the cavity at between 1,600 and 1,620 deg. C. Initial die temperature is between 100 and 150 deg. C., and the temperature differential is therefore of the order of 1,500 deg. C. Consequently, conditions are not favourable for feeding additional metal into the cavity to compensate for solidification shrinkage, and gate location is therefore particularly critical.

Gates should be located at the heaviest section of a casting, and runners should be kept short, as indicated in Fig. 2, and should be of trapezoidal section. The runner should extend directly from slug to casting. Branched runners of the type used with light alloys are unsatisfactory. Cross-section of the runner should diminish in area from slug to casting. If these conditions are fulfilled, dense castings without shrinkage cavities can be obtained.

The volume of the slug plays an important part in the production of a sound casting. In this connection, attention is drawn to Fig. 3, which shows a section of a slug obtained when the die was opened before solidification was complete. Liquid metal has been expelled, leaving a cavity at the junction of slug and runner. It was not

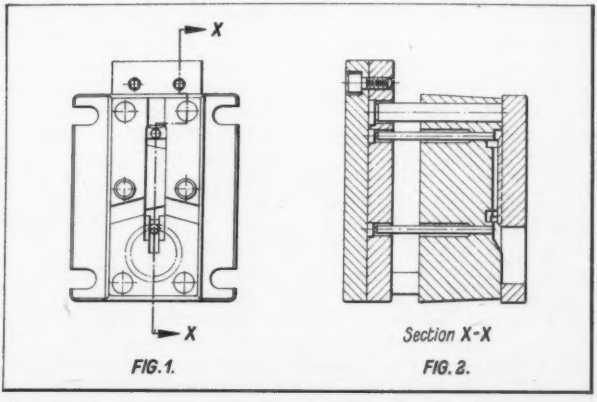


Fig. 1. A die for pressure casting a simple steel component
Fig. 2. Sectional view of the die in Fig. 1, taken on the line *x-x*

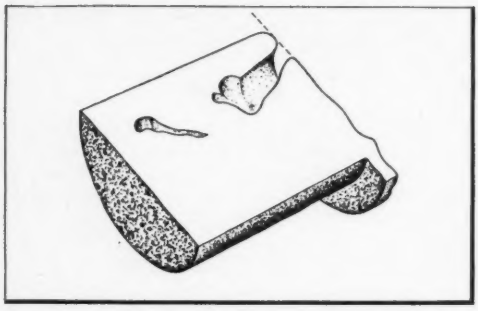


Fig. 3. To promote feeding during solidification, a heavy slug is desirable

found possible to obtain a similar cavity in a shorter slug, because the latter solidified simultaneously with—or before—the casting that was being produced.

It was possible to show the effect of slug length on the solidity of the casting, by producing flat test pieces with various lengths of slug. The results, as shown graphically in Fig. 4, indicated that when the slug length was progressively increased from 0·200 to 0·800 in., the density likewise increased until it reached a constant value. This result is explained by the better feeding properties of the longer slug, all other factors being constant.

The other important factor in ensuring freedom from voids is cavity venting during injection. Because of the large temperature differential between metal and die, the steel, on coming into contact with the cavity surface, solidifies instantaneously. Consequently, it is necessary to vent both from the far end of the cavity and from points adjacent to those portions that are the last to fill. Typical venting practice is indicated in Fig. 1, where one vent is provided opposite the gate, and two vents are located on the sides of the runner near the gate. Vents are from 0·004 to 0·006 in. deep, depending upon casting conditions. When pressure and injection velocity are increased, vent depth is reduced.

Steel die castings were first produced in Russia on a Polak 900 machine by a group of foundrymen under the leadership of E. I. Dunaev. Their work showed the practicability of the process, but it was found that the vertical shot-sleeve, characteristic of this type of machine, became barrel-shaped, with the largest diameter at the slug, after the first few shots. This effect was due to the localized heating, and shearing and ejection of the slug became impossible.

A machine with a horizontal shot-sleeve does not suffer from this drawback, but because of the large area of the sleeve which is in contact with the molten metal, greater superheating is necessary. This latter disadvantage, however, is not serious, and type 515 and similar machines have been found suitable for the die casting of steel.

MELTING AND FEEDING

The use of holding furnaces is not practicable with steel, as the molten metal quickly changes in composition due to the oxidation of some of the elements (C., Mn., Ti.) and the fact that other elements are picked up from the refractory lining. Moreover, metal transfer from a holding furnace is attended by technical difficulties and the working conditions for the machine operator are unsatisfactory. An improved technique was therefore sought, and the best results were obtained by using a small induction furnace, with a capacity sufficient to melt metal for a single shot, attached to the fixed platen of the machine immediately above the shot-sleeve. Fig. 5 shows such an arrangement, designed for mounting on a 515 die casting machine.

A billet measuring 0·8 to 1·6 in. diameter, and weighing from ten ounces to 2¼ lb., is placed in the melting chamber *A*, while the latter is in a horizontal position. On pressing a button, air is introduced into the cylinder *B* at a pressure of about 60 lb. per sq. in. The furnace is thus turned to the vertical position and the induction coil is energized. With the equipment described, from 50 to 90 sec. is required to raise the blank

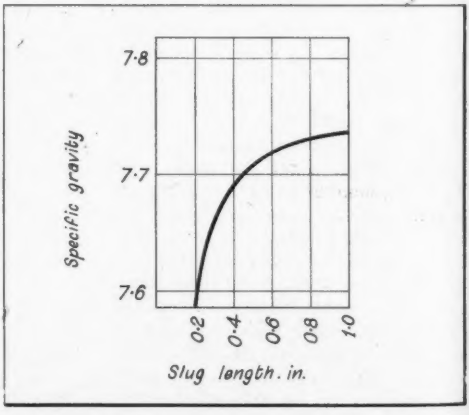


Fig. 4. Graph showing the effect of slug length on the density of the casting

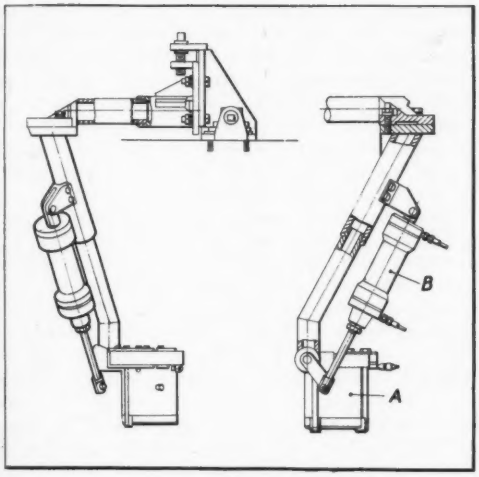


Fig. 5. Arrangement of induction melting furnace for the Polak 515 machine. The furnace pivots from the vertical to the horizontal position

to casting temperature, depending upon its weight. Under controlled conditions, melting time is constant to within ±5 sec. As soon as the steel has melted, the furnace is again turned to the horizontal position and the charge of metal is transferred to the shot-sleeve. The furnace is so mounted as to reduce the transfer distance to a minimum.

Composition of the furnace lining is selected according to the type of steel to be die cast, and the method of lining is the same as for conventional induction furnaces. Before starting to cast, the lining is cured by melting a charge of metal of sufficient volume to fill the whole melting zone, with the generator set to give the longest possible melting time. After curing the lining, one or two washing melts are made before casting starts. If a ring of solidified metal forms during normal operation at the top of the melting zone, the washing melts are repeated.

The billets are prepared by shearing measured lengths from rod of suitable analysis. Blank weight includes an addition to the casting weight of about 7 oz.—when using a 1·6-in. diameter plunger—for the slug. Optimum melting conditions must be determined empirically. Slow melting reduces productivity, but very fast melting causes overheating of the steel, which may then weld to the shot-sleeve or die cavity. In operation, this melting technique has proved reliable, and it can be recommended for industrial use.

VACUUM DIE CASTING

Where the requirements for the component are such that the presence of voids is not permissible, steel die castings may be made under vacuum. The entire die is then mounted within a vacuum chamber, and the air pressure in the surge tank is reduced to 1 mm. of mercury before starting to cast. The air is evacuated from the closed die by way of the runner and shot-sleeve, and a fall in pressure within the cavity to between 20 and 10 mm. of mercury is obtained in 1 sec.

INJECTION

When injecting the molten steel into the die, the replaceable plunger tip becomes heated and expands. A clearance of 0·002 to 0·004 in. is therefore provided between the plunger tip and shot-sleeve, and the tip is water-cooled. The flow of water is regulated by a valve controlled by a thermocouple located within the tip. To prevent metal from welding to the edge of the pouring hole in the shot-sleeve, a ceramic bush is fitted as shown in Fig. 6.

Investigation has established the effects of the main operational variables upon the pressure die casting of steel. These variables are: slug thickness, specific pressure and injection velocity. The effect of variations in casting temperature (for which, in any event, the range is small) and of the shape of the casting have not been studied. Die castings were made at specific pressures of 7,000 and 14,000 lb. per sq. in., with a plunger of 1·6 in. diameter. Plunger speed was controlled by modifying the accumulator pressure and by

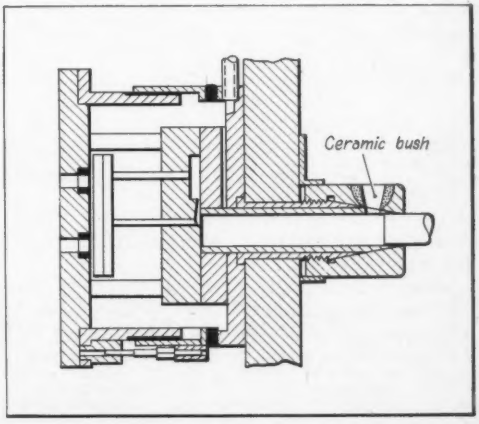


Fig. 6. Hooded die for vacuum die casting

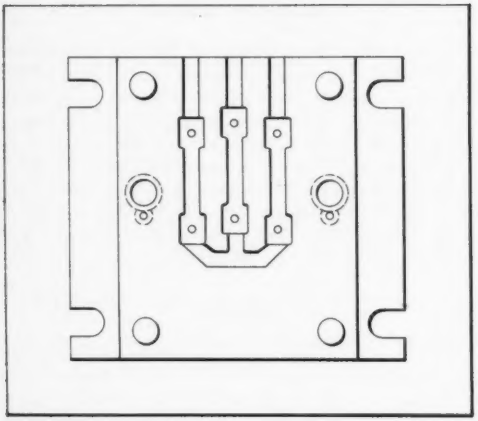


Fig. 7. Die for producing flat test bars in three thicknesses

means of valves on the machine, and the actual speed was determined by high-speed photography. The effects of the process factors were determined for flat test pieces 0·080, 0·160 and 0·320 in. thick. Die layout for these test pieces is shown in Fig. 7.

The effect of the gate depth upon the density and mechanical properties of die cast steel test pieces in 1Kh18N9T* is indicated in Fig. 8. In each case, the values shown for density, tensile strength, and elongation are averages from 25-30 specimens. As will be noted, the gate thickness has little effect upon the properties of the 0·080 in. thick test pieces, which show much the same values whether the gate is 50, 75 or 100 per cent of casting thickness. These thin test pieces could not be cast with a gate of only 25 per cent (0·020 in. deep) of casting thickness.

Thicker specimens are more sensitive to the gate/casting ratio, and it was found that the optimum ratio was 3 to 4. This ratio was therefore standardized when investigating the effects of specific pressure and plunger speed. Results obtained from the latter tests are summarized in Figs. 9 and 10. Broadly, the density, tensile strength and elongation increase with increasing injection pressure. Density and tensile strength are both greater for the thinnest (0·080 in.) than for the thicker test pieces, but the elongation

* A stainless, acid-, scale- and heat-resisting steel of the following percentage composition: C, 0·12 max.; Si, 0·8 max.; Mn, 2·0 max.; Cr, 17·0–20·0; Ni, 8·0–11·0; Ti (C – 0·03) × 5 to 0·8 max.; S, 0·03 max.; P, 0·035 max.

Fig. 8. Graphs showing variation of mechanical properties with changes in ratio between gate depth and casting thickness

Fig. 9. The effect of injection pressure on mechanical properties

Fig. 10. Increased plunger speed results in inferior mechanical properties

Fig. 11. A comparison between the properties obtained by conventional (non-vacuum) die casting and by the vacuum method

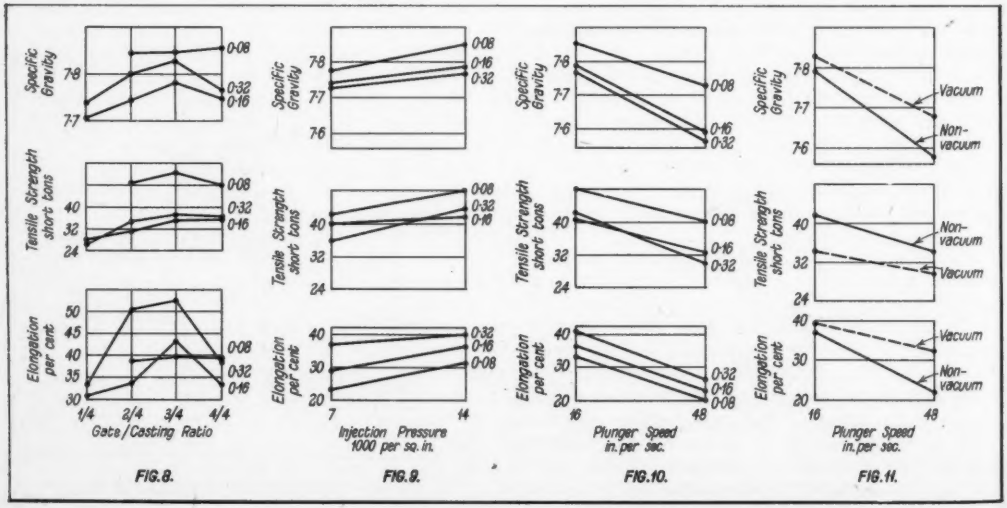


TABLE 2. MECHANICAL PROPERTIES OF PRESSURE DIE CAST STEEL

Property	Specification Requirements	Without Vacuum	With 20 mm. Hg Vacuum
Tensile strength, tons (short) per sq. in.	32	39·8	36
Elongation, per cent	25	37	39

shows an opposite correlation. This improvement in density and strength with higher pressure is attributed to better feeding while the casting is solidifying. The effect of increasing the plunger speed, on the other hand, is to decrease both density and mechanical properties, particularly with the thicker specimens.

In consequence, it is recommended that the die casting of steel be carried out at high pressure but with low filling speed. On the type 515 machine the maximum specific pressure available is 14,000 lb. per sq. in., corresponding to an accumulator pressure of 70 atmospheres. Minimum plunger speed is 16 in. per second. The effect of die evacuation is indicated in Fig. 11 and Table 2. The vacuum cast pieces were produced with a 3/4 gate/casting thickness ratio and at various injection speeds, and the values indicated are the averages for 50-60 measurements in each case.

It will be seen that the relationship between density and mechanical properties is broadly similar for both conventionally cast and vacuum cast pieces of 0·160 in. thickness. It will be noted that with vacuum the density is improved—although it does not reach that of rolled steel—whereas the strength is reduced, and this effect has not been fully investigated. The mechanical properties of the vacuum cast test pieces nevertheless satisfy the requirements of the relevant State Standard, provided that the optimum pressure and injection velocity are employed.

With conventional die casting technique it is extremely difficult to produce complicated steel castings free from internal voids, because of the very narrow ranges within which process variables must be held for satisfactory results, and only non-critical components can be made in this way. Where high density is important, vacuum techniques are recommended. The use of vacuum also offers the possibility of producing castings free from oxide inclusions when die casting steels contain titanium and other easily oxidizable elements.

Shrinkage defects can be largely eliminated by increasing the sizes of runners and gates. Should they then persist in the vicinity of the gates, an increase in the applied injection pressure may be necessary finally to correct the trouble. Plunger speed, however, is the most critical factor affecting the occurrence of shrinkage voids. Even if the die is evacuated, voids are formed at high injection velocities. On the other hand, flow lines appear on the surface of the casting when plunger speeds are very low, resulting in a characteristic frosted pattern. Optimum injection velocity must therefore be determined empirically.

Work in this field has supported the assumption that the incidence of voids is correlated with the character of metal flow. With low injection speeds and large runners, flow is smooth and uninterrupted and air escapes from the cavity ahead of the metal. With fast plunger speeds and shallow gates, the metal stream breaks into spray and blocks the vents at an early stage in injection, with the result that residual air and lubricant vapours are trapped. The amount of silicone lubricant applied to the cavity and shot-sleeve should be kept to the minimum necessary to prevent welding.

DIE MATERIALS

Several die materials were investigated, including low alloy and hot die steels, copper, and copper-based alloys. The usual die steels are completely unsuitable for pressure die casting steel. With such steels, erosion of the die surface becomes evident between the 10th and 20th castings. Materials with better plastic properties, such as Armco iron, low carbon steel, copper, and copper alloys, resist erosion better. Under favourable conditions, some hundreds of castings may be made from dies of these materials.

Pure iron, low carbon steels, and copper, however, have low strength, and deform when the metal is injected under high pressure. They are therefore unsuitable for industrial use. The main problem, at present, in connection with the development of a workable technique for the pressure die casting of steel on a production basis, is to find suitable materials for the dies.

ALLEN TYPE M.80 ILLUMINATED HAND MAGNIFIER.—A recent addition to the range of magnifiers made by P. W. Allen & Co., 253 Liverpool Road, London, N.1, is the type M.80, which incorporates a triple aplanatic lens with a magnification of 8×. Light is directed on to the object to be viewed by a 2·5-volt lamp fitted adjacent to the lens, to which current is supplied from a battery in the handle. This magnifier is intended, for example, for the use of inspectors and supervisory staff in precision engineering works.

Engineering, Marine, Welding & Nuclear Energy Exhibition–2

David Brown Industries, Ltd., Park Works, Huddersfield. Stand No. 4, Row P, Ground Floor, National Hall

As an example of the company's work in the field of high-speed gearing for turbine drives, a 3-lay-shaft co-axial helical unit is being shown on behalf of the General Gear Division. This unit, illustrated in Fig. 1, is typical of the multi-lay-shaft designs that have been developed to provide for the high ratios involved in turbine drives while keeping peripheral velocities down to reasonable values. Since there are no transverse forces acting on the input and output shafts, there is no need for a high-speed bearing. The low-speed bearing, which normally carries the weight of the gear assembly, and serves for location, can be used, if required, to support one end of an adjacent unit such as a generator armature.

Units of the type displayed are supplied to Ruston & Hornsby, Ltd., for application in gas turbine alternators. Such a unit is required to transmit 1,200 h.p., while reducing the speed from 13,000 r.p.m. to 1,800 r.p.m., and incorporates the drives for the fuel and lubricating oil supplies, tachometer, governor, and overspeed trip mechanism.

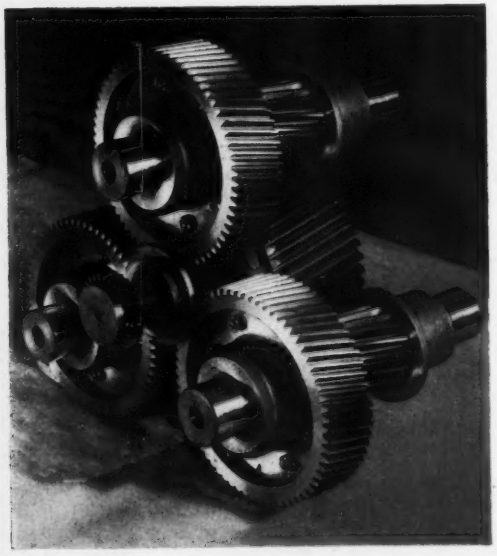


Fig. 1. David Brown turbine reduction gear unit

Among the general range of gearing on view is included a set of synchronizing gears for British Railways diesel locomotives. These spur gears are supplied to Vickers-Armstrongs, Ltd., who manufacture under contract to Sulzer Bros. (London), Ltd.

The latest range of Radicon worm gear reduction units is represented in two forms, namely, the Adaptable, which at present covers a range from 1⅝-in. to 3⅝-in. centres, in seven sizes, and the Solid Foot series, from 4-in. to 8-in. centres, in five sizes. Features of the new range include high thermal and mechanical ratings. Fan cooling has now been provided for the small Adaptable units.

Other standard products exhibited include Helicon geared motors and co-axial gear units, for drives up to 40 h.p. There are six sizes, with 34 standard ratios, which give output speeds from 12 to 304 r.p.m. The Varicon range of steplessly-variable speed reducers is also represented, and there is a selection of bronze and steel castings, gear cutting tools and floating reamers.

David Brown Foundries Division are showing a double-volute centrifugal pump, which has been introduced as a result of an agreement with the Bingham Pump Co., Portland, Oregon, U.S.A. These pumps are of the horizontal, single-stage type, and a feature of the design is that the hydraulic pressure in the casing is balanced at all diametrically-opposite points around the periphery of the impeller, throughout the operating range of the pump.

English Steel Corporation, Ltd., River Don Works, Sheffield, 9. Stand No. 1, Row Q, Ground Floor, National Hall

Most of the exhibits are products of English Steel Forge & Engineering Corporation, Ltd., and include a 31-ton forged alloy-steel gear wheel rim, of 13 ft. 6 in. diameter, for a marine engine reduction gear; a fully-machined marine turbine rotor forging of chromium-molybdenum steel, approximately 12 ft. long by 3 ft. diameter; a nuclear power vessel flange of 6 ft. 5 in. diameter; and two diesel-engine crankshafts. One of the latter, 11 ft.

6 in. long, is in the as-forged condition, and the other, which is 10 ft. long, is finish machined. Both crankshafts have been made by the C.G.F. process (continuous grain flow) for which the company has sole rights of application in this country. Selections of drop forgings and torsion bars for the general engineering industries are also on view.

Examples of cast-steel automatic couplers for industrial and mine cars are exhibited by English Steel Castings Corporation, Ltd., and coil springs for railway bogies are shown by English Steel Spring Corporation, Ltd. There are also samples of precision-ground bars, and tool steels, which are representative of the activities of English Steel Rolling Mills, Ltd.

Thos. P. Headland, Ltd., 10 Melon Road, London S.E.15. Stand No. 10, Gallery, Grand Hall

The principal exhibit on this stand is an Italian-built Meng 175 sliding, surfacing and screwcutting lathe, for which the company is selling agent in this country. This lathe has a centre height of 6⅝ in., and will accommodate work up to 40 in. long between the centres. A maximum diameter of 20½ in. can be swung when the gap piece has been removed. Drive between the motor and the headstock is transmitted by V-belts, and 6 spindle speeds are obtainable, which may range from either 50 to 1,500, or 40 to 1,200 r.p.m. The spindle is bored 1¼ in. diameter.

Headland Gauges, Ltd., 45-46 Lower Marsh, London, S.E.1—an associated company—are showing a type MT/2 optical projector from the Italian-made Microtecnica range, for which they have recently been appointed sole agents in this country. Some details of these projectors were given in MACHINERY, 98/622—15/3/61. Illustrated in Fig. 2, the type MT/2 projector has a 14- by 6-in. work table, which can be adjusted longitudinally, transversely for focusing, and vertically through a maximum distance of 4¾ in. For fine setting in the vertical direction, a worm can be swung into engagement with a wormwheel. Two interchangeable screens can be provided, one of which has a diameter of 9 in., and the other, dimensions of 11¾ by 13¾ in. Different magnifications from 5× to 100× can be obtained with the aid of interchangeable lenses. In addition, an attachment is available, comprising three lenses mounted on a horizontal slide, any of which can be readily brought to the working position, as required. There is another attachment which provides for illuminating the work for surface projection.

Attention may be drawn to three units from the DISONtegrator range of ultrasonic cleaning equipment, made in the U.S.A., which are being displayed by Headland Engineering Developments, Ltd.—another associated company. The units on view have container capacities of ½, 1½, and 5 gal. of cleaning fluid.

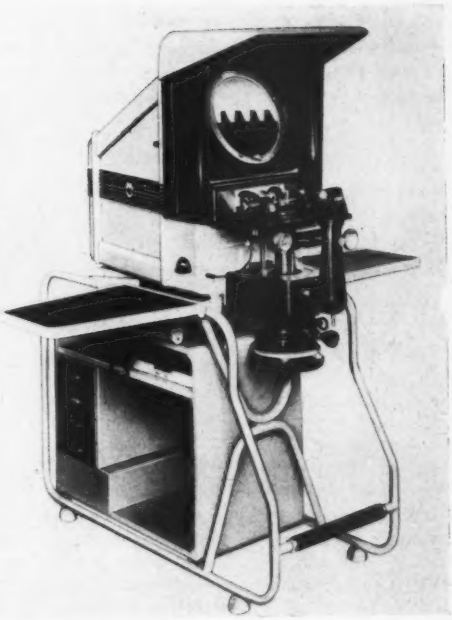


Fig. 2. Microtecnica type MT/2 optical projector

Soag Machine Tools, Ltd. 7 Juxon Street, Lambeth London, S.E.11. Stand No. 5, Row S, National Hall,

This company are showing examples from the wide range of clutches and gearboxes made by Ortlinghaus-Werke GmbH, Wermelskirchen, Germany, for whom they are the sole agents in this country. The clutches include multi-disc types which incorporate Sinus spring-steel laminations, and they are available in mechanically, pneumatically, hydraulically or electro-magnetically-operated forms. These Sinus discs are corrugated and interposed between the conventional flat plates. When operating force is applied, the corrugations are compressed, but they return and serve to separate the clutch plates when the force is removed. Full details of these clutches were given in MACHINERY, 98/431—22/2/61. The exhibits also include the type 25 electro-magnetic clutch, which has no slip-rings and does not require maintenance. This type of clutch is incorporated in the automatic power shift unit, which is one of a range of standardized gearboxes.

F. Bode & Son, Ltd., Buxton Road, Leek, Staffs. Stand No. 8, Row X, Empire Hall

This firm's exhibits of welding equipment include a type TRC14/10 heavy-duty bogie-mounted column and boom, the traversing speed of the boom being variable from 4 to 90 in. per min., by means of an English Electric Magamp unit, which also controls the traversing motion of the bogie. The column is of rigid tubular construction, and can be rotated through 360 deg. For power elevation of the boom, there is a motor equipped with an electro-magnetic brake. This column and boom will be equipped with a new design of automatic welding-head rotating device with variable speed drive.

Another exhibit is the type PTS38 longitudinal seam welding machine which has a capacity for tubes 3 ft. long, and from 8 to 48 in. diameter. A hand-operated hydraulic clamping arrangement is provided for the work.

The company's Rotilting positioners, of patented design, are represented by the type 10HH/A, of 10 cwt. capacity, and the type 20VP/A of 1 ton capacity. The former unit has hand operated rotating and tilting motions, while on the type 20VP/A, an English Electric Magamp enables the speed to be varied from 0·031 to 0·075 r.p.m. In addition, four types of conventional positioners are on view, namely, the 1VH, the 5VH, the 10VP, and the 200VP. The last mentioned unit, which is being exhibited for the first time, has a capacity of 10 tons, and is rotated hydraulically, and tilted by means of an electric motor. It can be supplied in free-standing form, or with a cradle which enables it to be manually elevated in three stages, from 6 ft. 1 in. to 8 ft. 7 in., when the table is in the horizontal position.

The type SAR400 self-aligning rotators, of patented design, have a capacity of 20 tons. They are particularly intended for handling pressure vessels, and provision can be made for speed control by a mechanical variator, or electrically by the Ward-Leonard system. A Bode positioner is seen in Fig. 3, holding a chassis assembly.

Thos. W. Ward, Ltd., Albion Works, Savile Street, Sheffield, 1. Stand No. 11, Row J, Grand Hall

Exhibits on this stand include examples of the Italian Ficep range of shearing and bending machines, and two Gosmeta power presses, built in Holland, for which the company are the sole agents in this country.

The Ficep "standard-super" size 16 combination punching, shearing, cropping, and notching machine, which incorporates a number of recent design improvements, has a shearing capacity for mild-steel plate up to ⅜-in. thick, and will punch holes up to 1$\frac{3}{16}$-in. diameter through ¾-in. plate. Bars up to 2 in. diameter or 1¾ in. square can be cropped, also 5- by 5- by ½-in. angles and tees, and notching can be carried out on ½-in. thick plate. Modifications have also been made to the design of the Ficep CCL "super" size 600 alligator shears, with a capacity for 2⅜-in. diameter mild steel bar, 10- by ¾-in. flat bar, 7- by 4-in. joist, and 8- by 3-in. channel. This machine can be supplied with wheels or arranged for floor mounting.

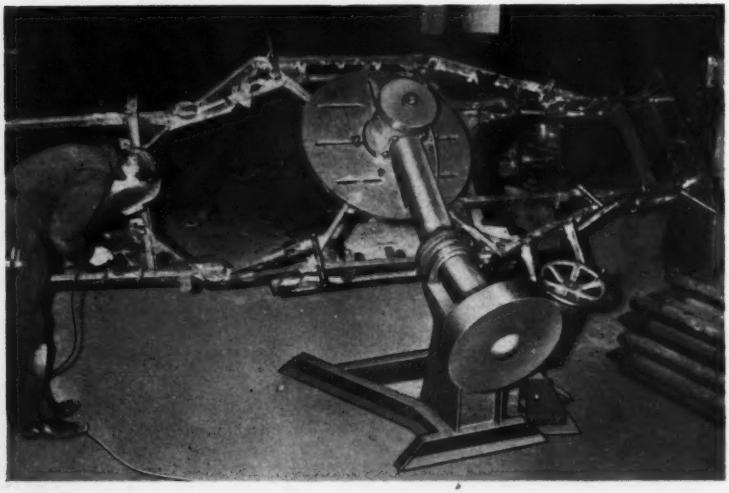


Fig. 3. A Bode welding positioner is here shown holding a chassis assembly

Available either with a portable cabinet base, or unmounted, the Ficep Colt type 3 combination shearing, cropping, and notching machine, has a capacity for ⅜-in. thick mild steel plate, 1¼-in. diameter bar, and 2½- by 2½- by ¼-in. angle. Special blades for cropping angle and T-sections can be fitted to this machine.

The Ficep Beton size B32 portable, power-operated bar shears is of compact design, and is readily transportable. It will shear mild-steel bar up to 1¼ in. diameter or 1$\frac{3}{16}$ in. square, and, with special blades, a range of

flat bars. The most recent addition to the Ficep range, namely, the type CAM size 32DV portable power bending machine, is particularly intended for use with the Beton portable bar shear. It is of all-steel construction and incorporates a 2-speed drive. Mild steel bars up to 1¼ in. diameter can be bent singly, and bars of smaller diameters, in multiples. In addition, the display includes Ficep hand-operated shears.

The larger Gosmeta power press on view is designated type DPS100. It is of open-fronted, inclinable design, with a capacity of 100 tons, and has a geared drive and provision for stroke adjustment. Shown for the first time in this country, the second Gosmeta press, known as the type EP25, has an ungeared, eccentric drive, and is also arranged for stroke adjustment. It is of open-fronted design, and has an operating capacity of 25 tons.

Another exhibit is a typical unit from the range of Oxford portable, self-contained, oil-cooled arc-welding transformers.

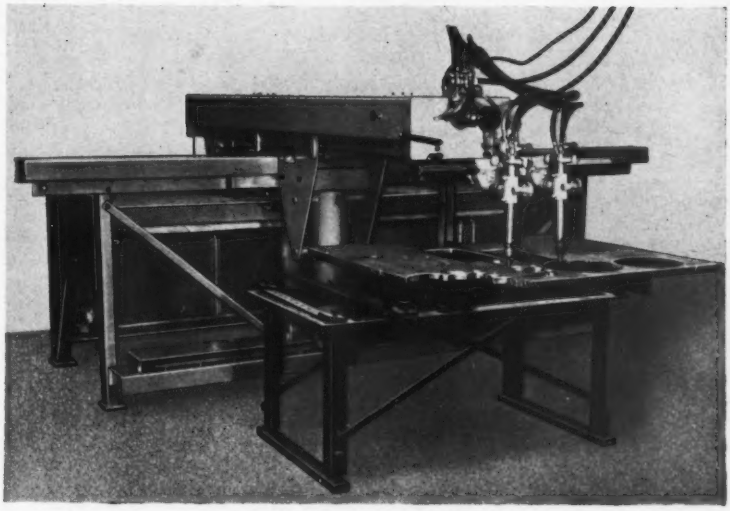


Fig. 4. S.I.F. 75 Cutamatic oxy-flame cutting machine

Suffolk Iron Foundry (1920), Ltd., Sifbronze Works, Stowmarket, Suffolk. Stand No. 3, Row Y, Ground Floor, Empire Hall

The recently-developed S.I.F.75 Cutamatic precision oxy-flame cutting machine shown in Fig. 4 incorporates an electro-magnetic follower for use with metal templates, and a hydraulic pressure control steering wheel, for use when following tracings. A trammel, adjustable centre pin, and counterweight arrangement is provided for ring and flange cutting. Normally, the machine is provided with two cutting heads which are adjustable for spacing, but additional heads can be fitted if desired. The maximum straight length that can be cut is 6 ft. 3 in., and the maximum width, 3 ft. 9 in., and circles from 5 to 48 in. diameter can be produced. Of special dual-purpose design, the heads can be used with either acetylene or propane gas. Bevel edges of any angle can be cut, by suitable adjustment of the heads.

Another exhibit is the S.I.F. Colibri cutting machine which is driven by clockwork and can be used for cutting, under hand control, any shape traced on the workpiece. With the aid of an angle bar, bevel edges can be cut, and a trammel and centring pin enable flanges and circles with either square or bevel edges to be produced.

The S.I.F. Combi profile cutting machine may be employed with a metal template and magnetic follower, or as a straight line and circle cutter. A 5-position switch enables different cutting speeds to be readily obtained to suit various thicknesses of metal.

A complete range of Sifbronze low-temperature oxy-acetylene welding rods and the appropriate fluxes is also displayed. A recent addition to the copper welding and brazing alloy group is silver solder No. 38 which has a melting point of 620/640 deg. C. In the cast-iron and hard surfacing alloys section, mention may be made of Sif-cut No. 40 composite rod, composed of tungsten-carbide particles in a nickel Sifbronze matrix.

The Demon cutting blowpipe, which is also on view, is designed on the injector principle and has a one-piece copper nozzle. It weighs 3¾ lb., has an overall length of 21 in. and a cutting capacity for thicknesses up to 10 in.

Goodyear Pumps, Ltd., 44 Brook Street, London, W.1. Stand No. 4, Row DD, First Floor, Empire Hall

This company—a member of the Holman Group—is showing a range of pumps for marine and industrial use, also complete unit pumping systems

with pre-wired electrical equipment, ready for immediate installation. The Goodyear positive-displacement rubber-to-metal self-priming pumps are suitable for handling a wide variety of liquids of low or high viscocity.

Developed from the type A pump, the type B 12 is being exhibited in both bronze and stainless steel. It has a speed range of 500 to 3,000 r.p.m., and the body is so designed as to permit dismantling without disturbing the pipe joints. This pump can be fitted with a new design of Goodyear automatic by-pass relief valve which incorporates a hand-operated unloading valve.

H. Williams & Son, Ltd., Lark Works, St. Albans, Herts. Stand No. 15, Row D, Grand Hall

Exhibits include two high-frequency spindle units of new, patented, design, and associated rotary converters, made by the C. Oberg Machine Co., Eskilstuna, Sweden, for whom the company is agent in this country.

Of 2-pole, squirrel-cage type, these units are designed for operation on a 3-phase supply of 42/50 volts, at a frequency of 1,200 cycles per sec., which is provided by the converters, and may be run at speeds ranging from 27,000 to 70,000 r.p.m. The body diameter of the No. 10 spindle unit is 1·3 in., and the overall length, 5·3 in., and the corresponding dimensions for the No. 17 unit are 1·8 and 7 in. Fig. 5 is a close-up view showing the No. 17 unit mounted in the head of a universal grinder, for internal operations with a tungsten carbide burr.

Other exhibits include Oberg burrs in tungsten carbide and high-speed steel, Swiss-made Compac and Parvus dial indicators and measuring equipment, and Lark de-scaling equipment and motor-driven spindle units, which have operating speeds from 10,000 to 100,000 r.p.m. In addition, there is a Swedish-built Hakanssons bandsawing machine.

The Walterisation Co., Ltd., Waddon Marsh, Purley Way, Croydon, Surrey. Stand No. 19, Outer Row, Gallery, Grand Hall

This company is showing a variety of industrial products which illustrate typical applications of their wide range of metal treatment processes. The latter include phosphate treatments for paint bonding, rust proofing, and coating in preparation for cold forming and extrusion operations. In addition, there are cold *in situ* treatments for rusty steel, and for aluminium and zinc surfaces; derusting and passivating solutions; a thixotropic, scale-removing jelly; a decorative black oxide treatment for steel; and a chemical oxide protective treatment for aluminium. Among other exhibits, reference may be made to an aluminium window frame, treated by the firm's Walterbryte process, and examples of parts to which the Cromcote chromate conversion treatment has been applied.

Garringtons, Ltd., P.O. Box No. 4, Bromsgrove, Worcs. Stand No. 1, Row L, Ground Floor, National Hall

The principal exhibit on this stand is an automatic induction unit designed to heat steel billets from 1 to 2 in. diameter or square, and from 2 to 9 in. long, to a temperature of 1,250 deg. C., at a rate of 2,000 lb. per hr. A feature of the heater is the continuous billet feed which eliminates electrical fluctuations by ensuring constant billet conditions within the heating coil. The feeding arrangement comprises a vibratory conveyor and a double belt device which is readily adjustable to suit different billet sections and lengths. This unit is representative of an extensive range of billet heating equipment made by the company, some of which has previously been described in MACHINERY, 95/168—5/8/59.

Included among other exhibits is a single-shot heating coil designed to demonstrate the rapid heating obtainable by the induction method. There is also a pair of medium frequency isolating switches housed in a cubicle and so connected as to provide a means of transferring the supply from one unit to another.

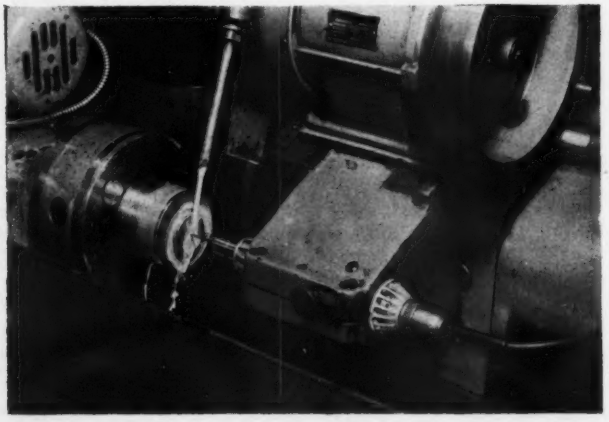


Fig. 5. In this close-up view, an Oberg No. 17 high-frequency spindle unit is shown set-up for internal grinding with a tungsten carbide burr

Solus-Schall, Ltd., County Building, Honeypot Lane, Stanmore, Middlesex. Stand No. 1, Row V, Empire Hall

Several recent additions to the company's range of non-destructive testing equipment are being shown on this stand. For automatic testing of longitudinal welds, for example, there is equipment which incorporates four miniature 70-deg. probes arranged in parallel, and an ultrasonic flaw detector and flaw alarm unit. Water is used as the coupling medium, and it is stated that the equipment enables defects in welds such as slag, cracks, lack of penetration and side fusion, also porosity, to be detected. It may be employed for testing welded steel plates from $\frac{3}{8}$ up to $\frac{3}{16}$ in. thick, and may be adapted for checking spiral welds.

Designed by Imperial Chemical Industries, Ltd., the recently-introduced type M 512, battery-operated, transistorized instrument illustrated in Fig. 6 affords a means of quickly checking the thickness of paint and metal coatings, which have been applied to ferrous metal parts. In use, the probe head, which is fitted with bearing balls, to ensure easy movement, is traversed over the surface of the work, and an audible signal is given by a loudspeaker built into the control unit when the thickness of the coating is less than the permissible minimum. For setting, the probe head is brought into contact alternately with two setting pieces, one of which corresponds to the nominal thickness of the coating to be checked, and the other, to the permissible minimum value. The instrument is then adjusted with the aid of a screwdriver so that a signal is obtained only when the head is in contact with the latter setting piece.

The new type 2211 transportable magnetic thickness gauge is particularly intended for checking corroded steel plates and pipes, and can be operated from a battery or mains supply. For checking, the probe head is held in contact with the work, and when a push-button is pressed, the thickness of the plate or tube is shown on a meter. Two working ranges are provided for the meter, which cover thicknesses up to $\frac{5}{16}$ in.

Another new product is the type USIP 10 ultrasonic flaw detector, which may be used for testing ingots, castings, forgings, and machined parts, also for examining various materials for elastic constants and texture. Attachments are available which give increased sensitivity, and provide for recording flaws in the work when testing is being carried out on an automatic cycle. The recently-introduced Conductitest 2·063 instrument has been specially developed for checking non-magnetic metals for electrical conductivity,

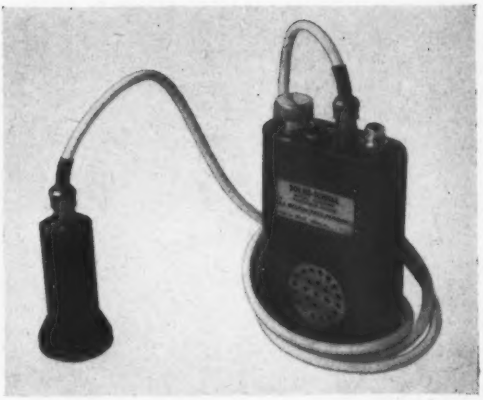


Fig. 6. Solus-Schall type M 512 audio gauge for checking the thickness of paint and metal coatings which have been applied to ferrous metal parts

porosity, hardness and other characteristics. It may also be employed for detecting impurities in metals, identification and sorting, checking for surface cracks, measuring the thickness of coatings of various types, and testing aluminium for tensile strength.

In addition, there is a new Junior mobile crack detector, for checking ferro-magnetic metals for flaws, with the aid of coloured magnetic powder or ink.

The Darlington Forge, Ltd., Darlington. Stand No. 15, Row H, Ground Floor, Grand Hall

This company is a wholly-owned subsidiary of English Steel Corporation, Ltd., Sheffield, and the exhibits are mainly concerned with the requirements of the nuclear energy industry, and include a 5-ton forged steel gas duct reinforcement ring. This ring, from which a test portion has been cut away to show the cross section, is similar to several that have already been supplied by the company for use at Bradwell nuclear power station.

Photographs of other products of the company are displayed, including forged steel shaft brackets, tail-shafts, back-posts, rudderstocks, and cast steel rudder frames for the shipbuilding industry; hoppers and bells for blast furnaces; and cast steel rolling mill housings.

Associated Electrical Industries, Ltd., Heating & Welding Department, Trafford Park, Manchester, 17. Stand No. 5, Row V, Ground Floor, Empire Hall

Demonstrations are being given of AEI submerged-arc welding equipment for the high-speed deposition of weld metal to high radiographic

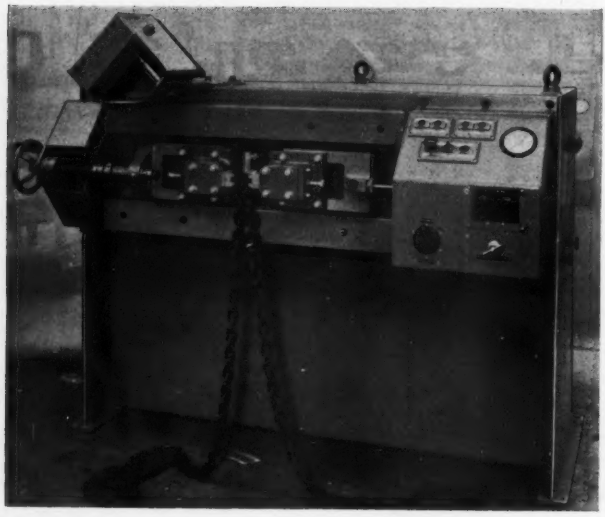


Fig. 7. A.E.I. machine for annealing chain links

standards, using bare electrode and granular flux. The electronic control, it is stated, ensures instantaneous arc initiation to obviate imperfections at the beginning of the weld, and subsequent arc reliability. The equipment can be adapted to operate on d.c. or a.c., and can be readily converted for open-arc welding, using a flux coated electrode. Modified heads can be supplied for CO_2 welding.

The new AEI DA 400 Paradyne welding equipment is a portable, d.c., single-operator set which provides smooth, steplessly-variable control from 30 to 400 amp. It is mounted on rubber-tyred wheels to provide for easy movement, and comprises a motor-generator set, control gear, selector switches, motor starter, and socket outlets. The d.c. generator has a drooping characteristic to reduce power loss during welding.

For a.c. arc welding there is the AEI Thermac, single-operator, portable set, which is suitable for 400-, 420-, or 440-volt supply and gives 250 or 350 amp. maximum continuous current for hand welding. The current regulator is of the moving coil type, and is said to provide complete freedom from vibration effects.

A single-operator, portable, a.c., atomic-hydrogen welding set, which is being shown, is designed for operation on a 200/220, or 400/440 volt supply, and is particularly intended for producing homogeneous and ductile welds in light-gauge sheet, or for hard surfacing blanking tools. It can also be employed for chain-link welding by hand.

Attention may also be drawn to the type AP 200 general-purpose, heavy-duty projection welding machine, which has a thermal rating of 15 kVA. at 50 per cent duty cycle. Typical welding capacity is six projections in 0·080-in. thick mild steel sheet. On this machine, the welding circuit is completed through an electronic contactor in the base of the machine. For special purposes, a fully-synchronous external electronic control panel can be supplied.

Shown in Fig. 7 is an AEI chain link annealing machine which is being demonstrated. The links are annealed individually and the time and temperature controls are fully automatic. Another exhibit is the type RP 10 special purpose machine which parts wire ropes by resistance heating, leaving the ends sealed and tapered.

The type MS 307 wire butt-welding machine is suitable for use with ferrous and non-ferrous materials. Although primarily intended for wire and simple sections, the machine can also be employed for welding strip, for example, bandsaws up to ⅝-in. wide.

Imperial Chemical Industries, Ltd., Millbank, London, S.W.1. Stand No. 30, Gallery, Grand Hall and Stand No. 6, Gallery, National Hall

The Metals Division, and the subsidiary company Marston Excelsior, Ltd., are showing four main groups of exhibits on Stand No. 30, concerned with nuclear engineering, titanium, heat exchangers and heat exchange products, and general engineering materials.

In the nuclear engineering section there are examples of components in zirconium, beryllium, hafnium and other metals. Boroplast, a boronized plastics material for use in radiation shields, is included in the display. Applications of titanium relating to metal finishing, plant for the chemical industry, and cathodic protection, are being featured.

A cross section of an aluminium secondary surface heat exchanger is on view, together with a model of a typical installation. Other exhibits comprise Integron integrally-finned High-fin and Low-fin forms in copper, copper alloy, aluminium and bi-metal, for use in the electrical, petrochemical, air-conditioning and other industries. There are also roll-welded heat transfer sheets in Impalco aluminium. In addition, bursting discs

in a variety of metals and other materials are displayed.

Billingham Division exhibits on Stand No. 6 draw attention to the uses of both liquid and solid CO_2 in industry, for example for shrink fitting, rubber de-flashing, welding, and the CO_2/silicate process. An I.C.I. standard 5-ton storage tank for liquid CO_2 is on view, also a liquifier for Drikold solid CO_2 for use by the small consumer.

Keelavite Hydraulics, Ltd., Allesley, Nr. Coventry. Stand No. 16, Row A, Grand Hall

A comprehensive range of hydraulic pumps, control valves, actuators, and auxiliary equipment is being shown on this stand, including several new products. To meet the increasing demand for gasket-mounted control valves, the company is now making valves of this type with port sizes from ¼ to 1 in. B.S.P., suitable for pressures up to 3,000 lb. per sq. in. The types on view comprise directional, non-return, relief, pilot-operated non-return, and flow control valves. The range is to be extended to 2 in. B.S.P. in the near future. On the left in Fig. 8 is shown the type NR 0104G non-return valve, and on the right, the type VDV 0104G relief valve.

A new series of fixed-capacity piston pumps, known as the type KG, for developing pressures exceeding 7,000 lb. per sq. in., is now available. A working exhibit demonstrates the exceptionally quiet operation of these pumps even at high pressures. This exhibit takes the form of the new Keelapak cabinet, designed to house a small compact hydraulic installation while allowing free access to the component parts. A KG range of forged-steel control valves has been developed for use with these high pressure pumps, and includes directional, relief, off-loading, back-pressure, pressure switch, reducing, and decompression types.

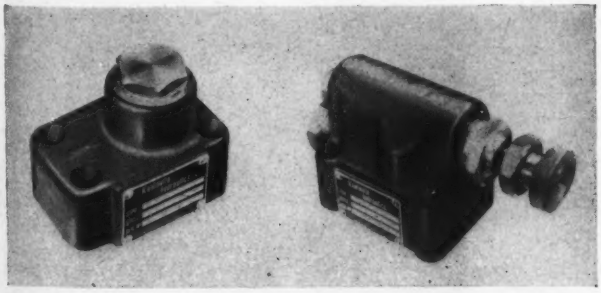


Fig. 8. The new range of Keelavite gasket-mounted control valves includes the type NR 0104G non-return valve (left) and the type VDV 0104G relief valve (right)

Another exhibit is the recently-introduced KeelaRing pipe coupling for high pressures, up to 7,500 lb. per sq. in., which is of cadmium-plated steel and is available in a range of standard sizes. It may also be noted that the KeelaTite pipe couplings are now available in stainless steel, as required, for example, by the chemical processing industries.

Two control systems for the Hydro-Titan series of variable-capacity axial piston pumps are being shown, namely, hydraulic-servo, and electro-hydraulic servo.

Reference may also be made to a hydraulic gear pump/motor unit which is being built by the company for industrial use. As a pump it has a capacity of 96 cu. in. per rev., and as a motor it develops a torque of 1,400 lb.-in. per 100 lb. per sq. in. applied pressure. A full-size model of this unit is on view.

Ultrasonoscope Co. (London), Ltd., Sudbourne Road, Brixton Hill, London, S.W.2. Stand No. 4, Gallery, National Hall

The portable Mark 2 ultrasonic flaw detector, shown by this company, will transmit vibrations in the frequency range from ½ to 10 megacycles per sec. to a maximum depth of 20 ft. in steel. It incorporates a 5-in. diameter cathode ray tube, and the total length of the time base can be varied by coarse and fine controls to correspond with echo distances down to 1 in. This instrument, which has a power consumption of 120 watts, weighs 38 lb., and measures 9¾ by 17½ by 13 in.

With the new Mark 3 flaw detector, ultrasonic vibrations in the frequency range from 1½ to 5 megacycles per sec. can be transmitted to a maximum depth of 4 ft. in steel, and the length of the time base can be adjusted to correspond with echo distances down to ½ in. The instrument, which can be operated in conjunction with either one or two probes, incorporates a 5-in. diameter cathode ray tube, and can be fitted with a camera attachment for photographing the trace obtained from the reflected waves. A contrast control is provided which enables spurious echos received from grain boundaries in the work to be reduced to a minimum, with consequent improvement in definition.

In Fig. 9 is shown a close-up view of the company's latest probe manipulator, for use in conjunction with their ultrasonic flaw detectors. This equipment enables the probe to be adjusted in a vertical direction through a maxi-

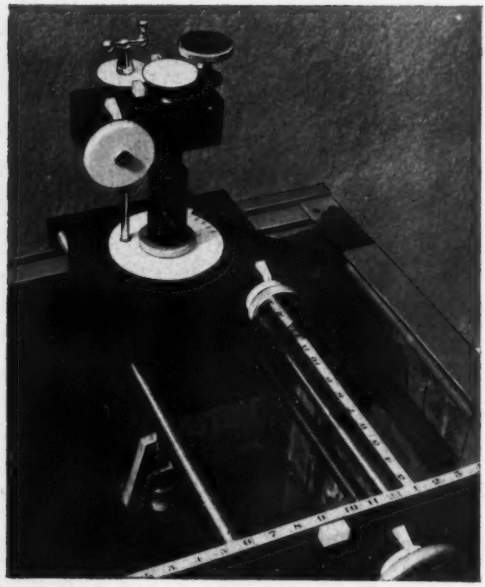


Fig. 9. Ultrasonoscope probe manipulator for use in conjunction with an ultrasonic flaw detector

mum distance of 10 in., rotated about a vertical axis through a full circle, and tilted through a maximum of 200 deg. Scales are fitted to facilitate setting, and provision is made for eliminating backlash in the mechanism for rotation and tilting. Facilities are provided for setting the face of the crystal in line with the axis about which tilting takes place, after the probe has been mounted in the associated holder.

Crofts (Engineers), Ltd., Thornbury, Bradford, 3. Stand No. 6, Row BB, First Floor, Empire Hall

The range of Par-O-Mount worm reduction gears, which are now designed for universal mounting, has been extended by the addition of a new size of 1·33-in. centres. A 3-in. centres Par-O-Mount unit is shown sectioned to indicate its ready convertibility to right-angled, variable-speed drive. A special worm reduction gear designed for agitators has an output shaft with large flange and bearings adequate for the heavy loads involved in this application.

A new metric range of shaft-mounted gears providing ratios of 5 to 1, 15 to 1, and 20 to 1 is now available. This range is externally interchangeable with the existing series, and the power ratings are the same. Attention is also drawn to a steplessly-variable speed unit which provides high output speeds and may be direct coupled to the motor, or driven through V-belts or a Power Grip belt. One of these units is shown combined with a multi-speed gearbox, which is available in 2-, 3-, and 4-speed types, to increase the range of steplessly-variable output speeds.

A horizontal-type Klosed variable speed gear, of improved design, is arranged for centralized lubrication. Before assembly, the surfaces of sliding components of this unit are specially treated to reduce friction. A combination of a Croft-Ring flexible coupling and an internal-gear half coupling is also shown, which provides considerable torsional flexibility, to accommodate appreciable misalignment of shafts.

Another exhibit on this company's stand is a Ritespeed conveyor pulley unit with gearing incorporated within the barrel, which is small and compact. In addition, there is a special worm-geared motor unit fitted with V-rolls for conveying tubes. It is stated that 500 of these units have already been supplied to a firm in Italy.

Metallisation, Ltd., Barclays Bank Chambers, Dudley, Worcs. Stand No. 10, Row K, Ground Floor, Grand Hall

Attention is drawn on this stand to the application of the Sprayflow Stellite hard-facing technique, for which the Metallisation Mark 33 metal spraying pistol, seen in Fig. 10, is employed, with the SF6, SF12, and SF1 Stellite alloys in rod form, produced by Deloro Stellite, Ltd., Highlands Road, Shirley, Solihull, Warwicks. This recently-developed process is claimed to offer particular advantages when hard-facing deposits less than $\frac{1}{16}$ in. thick are required. The deposits

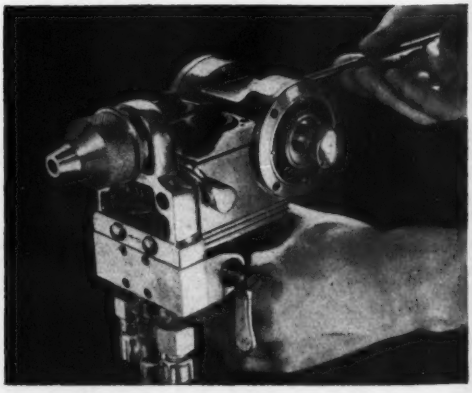


Fig. 10. Metallisation Mark 33 hard-facing metal spraying pistol

so applied exhibit the typical structure of sprayed metals, but by means of a subsequent fusing operation, they are converted to a homogeneous overlay which is metallurgically bonded to the parent metal. Analysis, it is stated, shows no detectable increase in iron content even at a distance of 0·006 in. from the junction. The spraying process can be rapidly performed and requires a minimum of skill.

J. Brockhouse & Co., Ltd., 25 Hanover Square, London, W.1. Stand No. 9, Inner Row, Gallery, and No. 11, Row B, Grand Hall

The Drop Forge Division of the company is showing examples of drop forgings for the transport and general engineering industries, and Kaye Alloy Castings, Ltd., gravity and pressure die castings in aluminium and zinc alloy. Cold-rolled sections in ferrous and non-ferrous metals are displayed by Warwick Rim & Sectioning Co., Ltd., hot-rolled steel angles, by District Iron & Steel Co., Ltd., and quantity-produced grey iron castings, by R. & J. Hunt & Son, Ltd. The Polygon tool-box for turning triangular, hexagonal, octagonal, and irregular shapes, is exhibited by Thomas Chatwin & Co., together with engineers' tools and cutters.

On Stand No. 9, five types of torque converter transmission units are being shown, including the FLT, which embodies a torque converter coupling and an epicyclic gearbox, and gives one forward and one reverse drive. It has an input capacity of 90 to 150 lb.-ft. torque, and is intended, for example, for use in fork-lift trucks, cranes, road rollers, and shunting locomotives.

To meet the demand for a lighter-duty version of the FLT transmission, the type 056 has been developed, with an input capacity up to 100 lb.-ft. torque. It provides one forward and one reverse drive, and has constant mesh gearing, and a power-shift gear change.

Shown in prototype form, the new D 56 transmission, which is fitted with a torque converter coupling, has an input capacity up to 100 lb.-ft. torque. There are two forward and two reverse drives, and the unit incorporates constant mesh gearing with hydraulic clutches.

Tecalemit, Ltd., Plymouth, Devon. Stand No. 7, Row K, Ground Floor, Grand Hall

Nylon Fullway high-pressure hose, which is being shown for the first time, is light in weight, durable, and has good chemical-resistant properties. It is suitable for pressure lines for air, coolants, lubricants, hydraulic fluids and many chemicals, and is available in bore sizes ranging from ⅜ to ½ in. A range of re-usable end fittings,

Fig. 11. Tecalemit Fullway nylon high-pressure hose and end fitting

as seen in Fig. 11, has been introduced for use with this hose. The smallest passage through each fitting is only slightly less than the nominal inside diameter of the hose, so that there is very little obstruction to flow.

A range of nylon precision extruded tubing, with outside diameters ranging from ¼ to ⅜ in., and in flexible and semi-rigid forms, is also being shown. This tubing is heat and light stabilized, and has chemical properties similar to those of the high-pressure hose. Drive-in end fittings are available for the flexible tubing, and standard compression fittings for the semi-rigid tubing.

A selection of injection mouldings produced to customers' requirements is on view, including nylon gears with metal inserts. The company's well-known range of lubricating equipment is represented by Brentford mechanical lubricators, Bijur mechanical and hand lubricators, radial mechanical lubricators, P.C. and H.O. pumps, and a single-line grease injection system. Other items include nipples, hand lubricating guns, pipe-line oil filters and elements, and ribbon elements for the high-flow filtration of air, fuels, and hydraulic and lubricating oils.

The English Electric Co., Ltd., English Electric House, Strand, London, W.C.2. Stand No. 4, Row W, Ground Floor, Empire Hall

With the LWAD range of welding equipment shown on this stand, an a.c. or a d.c. output can be selected by means of a switch. Such a unit can be used as a power source for inert gas welding processes as well as for metal arc welding.

The power source is static, and requires little maintenance, and it is stated that the high efficiency ensures economy in operation. The unit is oil cooled, as are the silicon diode rectifiers, which will operate at temperatures up to 190 deg. C.

The LWC range is intended for use where demand does not justify the installation of multi-operator plant, and the five sizes provide welding currents from 30 to 630 amp. One of the units in the range incorporates two current regulators and will supply two welders with 315 amp. each. Alternatively, when occasional heavy-current welding is to be performed, the outputs can be connected in parallel to provide 630 amp. for one welder. As in the case of the LWAD range, the power source is static, and the equipment is oil cooled. Power factor correction capacitors can be fitted, if required.

Various electrodes are shown, including the Thermees, for heating work before welding, and for bending or straightening; Groovees for grooving, gouging, and piercing; Vohees for vertical and overhead welding of mild steel; Pyristees for creep resisting steels; Weldees, all-position, for mild steel; Speedees, Hermees, Pressurees and I.P.1, iron-powder types with high deposition rates; and super Stainees for the rapid welding of stainless steel.

Accessories include a new hand shield of resin-bonded fibre, and a welding meter. The latter, which is intended for use in connection with a.c. welding production, development, and research, measures the electrical conditions in the arc. It consists of a watt-hour meter, ammeter, voltmeter and protective relay, all housed in a case measuring 16½ by 5⅝ by 6⅝ in., which is suitable for switchboard or wall mounting. There is also a display of ignitrons for accurate control of resistance welding equipment.

Alfa-Laval Co., Ltd., Great West Road, Brentford, Middlesex. Stand No. 5, Row F, Grand Hall

De Laval centrifugal coolant clarifiers for grinding machines are available in two sizes, the larger of which (see MACHINERY, 91/769—27/9/57) will handle 33 gal. of fluid per min. Known as the Turbomatic Minor, the smaller clarifier (96/266—3/2/60) is particularly intended for use on small and medium-size grinders, and has a throughput capacity of 13 gal. per min. Both units give an exceptionally high degree of clarification, and since they ensure removal of foreign matter which might cause the coolant to deteriorate or turn sour, the life of the fluid may be greatly extended.

When the unit is in operation, contaminated coolant is passed into the centrifuge by the action of impeller blades, and metal and abrasive particles are then directed outwards on to the inner face of the bowl. Sludge, which has been built up in this way, is removed from the bowl, to be discharged by gravity into the base, by the swirling action of the coolant which results when a reversing current is applied to stop the driving motor quickly. On the smaller clarifier, this operation is carried out automatically at 1-hour intervals, under the control of a timer.

The display also includes spray-type washing equipment for cleaning metal components, single- and dual-type strainers, and heat exchangers. In addition, there are examples from the company's range of centrifuges for handling contaminated heavy fuels for diesel engines, gas turbines, and free-piston engines.

B. Elliott (Machinery), Ltd., Victoria Road, London, N.W.10. Stand No. 13, Row A, 10, Row C, and 9, Row D, Grand Hall

A representative selection from the extensive range of machine tools and production equipment made by the company and their associates, is being displayed on these stands. For instance, examples from the Elliott Victoria range of hydraulic copy milling machines, also Elliott Cardiff hydraulic copying lathes are being shown.

Mention may also be made of the latest Elliott

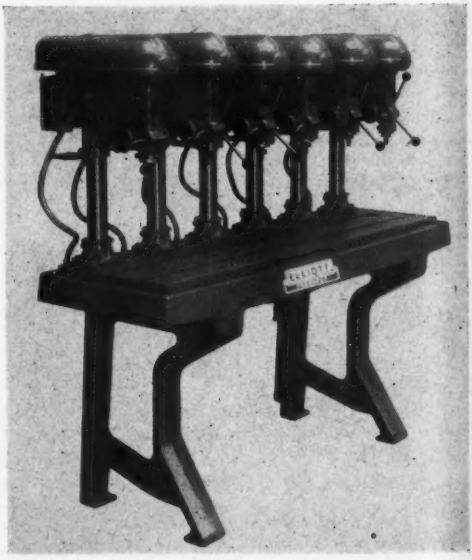


Fig. 12. One of the new Elliott Progress multi-spindle drilling machines

Progress multi-spindle drilling machines, which can be supplied with 19¾-in. wide work-tables, with overall lengths of 31¾, 49¾, and 67¾ in., and Progress C. No. 16 and No. 1, ½-in. capacity drilling heads, also No. 2G, ⅝-in. drilling heads, in various combinations. The machine shown in Fig. 12 has the largest work-table in the range, and is fitted with six No. 1 heads. On the latest designs, the drilling heads can be adjusted on the tables, so that different centre distances can be obtained to suit requirements. As compared with the earlier machines, this feature enables an increased number of drilling heads to be accommodated in some instances.

The drilling spindle of the C. No. 16 head has an axial travel of 3½ in. and 4 spindle speeds, from 460 to 2,900 r.p.m. Five speeds from 340 to 2,580 r.p.m. are obtainable with the No. 1 drilling head, and 10 speeds, from 45 to 2,460 r.p.m., with the No. 2G. For both heads, the spindle travel is 4 in. The maximum distance obtainable between the end of the drill chuck and the top surface of the table is 16 in. with the C. No. 16 head, 15½ in. with the No. 1, and 21¾ in. with the No. 2G.

Edgar Vaughan & Co., Ltd., Legge Street, Birmingham, 4. Stand No. 15, Gallery, Grand Hall

Industrial cleaning preparations from the Cerfa-Kleen range recently introduced by the company are included among the exhibits on this stand. Cerfa-Kleen CST fluid is intended to be diluted with water, and may be applied cold, or heated to a temperature of 120 to 150 deg. F., for removing buffing compounds from components in preparation for anodizing, for instance. For such applications, the work is usually dipped in the solution, but for cleaning machine tools and large assemblies, the fluid may be applied by means of a cloth.

Supplied in powder form, Cerfa-Kleen CPW compound is intended to be mixed with water, for use in high-pressure, spray-type washing plants. It can be applied to the work cold for removing cutting and grinding oils, also light drawing and stamping lubricants, but may be heated to a temperature of 100 to 130 deg. F. for washing components contaminated with highly-viscous oils and drawing compounds. Other products in the range, which, again, are supplied in powder form, are marketed under the trade names Cerfa-Kleen HST and Cerfa-Kleen HPW. The former is intended to be heated to a minimum temperature of 150 deg. F. for use in a hot soaking tank for cleaning heavily-contaminated components in ferrous and most non-ferrous metals. Intended for use in high-pressure, spray-type, washing plants, Cerfa-Kleen HPW compound is usually heated to a temperature of 150 to 185 deg. F., and contains a water-soluble rust preventive, known as Rust Veto M.P.

Among other products on view, may be mentioned cutting oils, for example, for broaching and grinding, drawing lubricants, and liquid salts, oils, solid carburizers, and quenching media for heat treatment work.

Anderton Springs, Ltd., Clyde Street, Bingley, Yorks. Stand No. 1, Gallery, Grand Hall

On this stand there is a representative selection from the extensive range of circlips and retaining rings which are made by the company in a wide variety of types, and in sizes to suit bores and shafts from 0·039 up to 20 in. diameter.

When circlips are required in fairly small numbers, for instance in connection with prototype and development work, they can be supplied in packs. A total of seven packs is available, each of which contains one type of circlip in a variety of sizes. Wall charts are available, which give diameters and widths of grooves to be cut in bores and shafts to take circlips of different types, and a calculator has been introduced, from which information concerning shaft and bore diameters, and end thrust ratings for circlips, can be obtained. In addition, various tools and accessories, which the company has introduced to facilitate assembling circlips, are being shown.

Kerry's (Ultrasonics), Ltd., Warton Road, Stratford, London, E.15. Stand No. 10, Row DD, and 6, Row EE, First Floor, Empire Hall

Ultrasonic cleaning units are made by this company in various sizes, the largest of which has a capacity for 80 gal. of fluid, and examples from the range are being demonstrated on Stand No. 10. Attention may also be drawn to equipment for ultrasonic machining hard and brittle materials, such as glass, ceramics, and tungsten carbide. The units on view are designed for operation in conjunction with ultrasonic generators with ratings from 60 to 500 watts, and have capacities for drilling holes up to 2 in. diameter.

On Stand No. 6 are displayed examples of percussion-type, high-capacitance, stud welding equipment from the range made by Omark Industries, Inc., Portland, Oregon, U.S.A., for whom the company has been appointed sole agent in this country. This equipment, which is marketed under the trade name Kerry-Omark, enables studs and pins in a wide variety of shapes, and diameters up to ¾ in., to be welded to metal plates with thicknesses down to 0·020 in.

The pin or stud to be welded may be held either in a portable gun or in a bench-mounted welding

head, and at one end there is a small pip, which is brought into contact with the metal plate. At the beginning of the welding cycle, a d.c. supply is passed to the stud, which causes an arc to be struck between the pipe and the metal plate. Capacitors built into the equipment are then discharged, to provide a current of 300,000 amp. per sq. in. at 80 to 90 volts, which melts the pip and metal at the end of the stud and the plate. Finally, the stud is advanced into contact with the plate at a controlled speed to complete the welding operation, and this action ensures that oxides between the surfaces are expelled outwards. Since the metal plate is melted for a depth of only a few thousandths of an inch, it is claimed that burning and marking of the opposite side is avoided. In consequence, the equipment may be employed for welding of studs to parts which have been painted, or are made from plastics-coated metal.

Alfred Herbert, Ltd., Coventry. Stand No. 8, Row W, Empire Hall

Exhibits on this stand include the type X8 bevelling machine for preparing the edges of steel plates, tubes, and angle sections for welding, also two plate and sheet-metal working machines, from the Pullmax range which is marketed by the company in the United Kingdom.

Illustrated in Fig. 13, the type X8 machine can be supplied for cutting bevel angles of 30, 37½ and 45 deg., and four different types of cutter are available, which are intended for use on different metals and for producing bevels of various depths. Drive from the motor is taken by V-belts, through gearing which runs in an oil bath, and two spindle speeds are available. A scale is provided to facilitate adjusting the work-support roller for setting the depth of cut, and an adjustable hold-down unit is fitted.

If required, the machine can be supplied mounted on wheels or a carriage, so that it can be readily moved on the shop floor, and a turn-table, with an air-operated lifting arrangement, is available for supporting large workpieces while bevelling is in progress. With this arrangement, the table—and with it, the workpiece—can be raised clear of the support roll when bevelling has been completed on one edge, and then turned to present another edge to the cutter. Alternatively, the entire machine can be suspended from a travelling crab mounted on an overhead gantry, when bevels are to be cut on exceptionally long plates. The plate is then supported by trestles on the shop floor, and when the cutter has been brought into engagement with the edge to be bevelled, feed is imparted to the entire machine in the horizontal direction.

The British-built type P5/2 plate and sheet-metal working machine has a throat depth of 41 in., and will handle mild steel plates up to $\frac{7}{32}$ in. thick. In addition to nibbling operations for cutting straight and profiled edges and slots, the machine may be employed for louvring, beading, forming dome-shaped surfaces, and folding operations, on parts in a wide variety of metals. The box-section frame is of welded steel construction, and the drive mechanism for the cutter slide runs in an oil bath. There is a choice of two working strokes, and the operating speed can be changed without the need for stopping the machine.

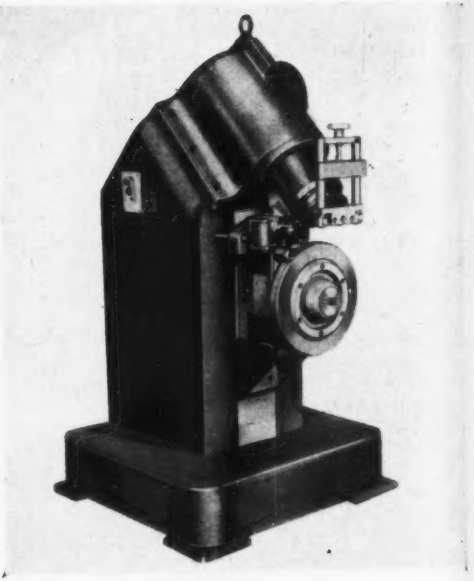


Fig. 13. Pullmax type X8 bevelling machine for preparing the edges of steel plates and tubes for welding

The type U.10 machine, which is on view, is the largest in the Pullmax range, and has a throat depth of 41¾ in. and a capacity for cutting mild steel plates up to $\frac{13}{32}$ in. thick. Operating speeds range from 350 to 1,800 strokes per min., and the working travel of the cutter slide can be varied in 10 steps from 0·001 to ⅜ in. A motor-driven arrangement provides for automatically lowering and raising the cutter slide at the beginning and end of the working cycle. Equipment available for use on the machine includes an attachment for cutting circles, a guide piece to facilitate straight-line cutting, and tools for cutting H-section bars and for forming dished ends.

Canadian Government Exhibition Commission, 60-61 Trafalgar Square, London, W.C.2. Stand No. 16, Row K, Grand Hall

Mimik hydraulic copying attachments from the range developed by Retor Developments, Ltd., Galt, Ontario, Canada, which were described in MACHINERY, 97/1296—7/12/60, are being demonstrated on this stand. These demonstrations are being staged by the Newton Abbot Engineering Co., Newton Abbot, Devon, who have recently been appointed sole agents in this country for the attachments.

Three basic types are available, the first of which, designated series 9000, is intended for use on centre lathes, also turret lathes and planing, shaping, and milling machines. The series 4000 attachment is designed for mounting on the spindle quill of a vertical milling machine for die-sinking operations, and the series 3000 may be used on vertical turning and boring mills. Templates for controlling the movements of the copying slide are prepared from 0·003-in. thick shim-stock, with the aid of a Templator attachment, which is intended for mounting on the spindle head of a vertical milling machine, and is fitted with a non-rotating knife-edge cutter. The template is secured by means of an adhesive, between two stiffening pieces made from ⅛-in. thick plastics material.

A high degree of stability is claimed for the overlapping, spool-type hydraulic valve incorporated in the tracer head, which is operated by deflection of the stylus pin axially, or in any direction radially under a pressure of about 6 oz. It is stated that profile shapes can be reproduced on the work to an accuracy of 0·0003 in. The tracer head, which is mounted on a compound slide assembly, can be adjusted in two directions at right-angles to an accuracy of 0·001 in., by means of knobs, for setting the depth of cut, and with this arrangement, the need for a separate tool slide on the attachment is avoided.

Castrol Industrial, Ltd., Castrol House, Marylebone Road, London, N.W.1. Stand No. 11, Gallery, Grand Hall

Exhibits on this stand include a universal centralized lubrication system for either oil or grease, which has been developed by the company and forms the subject of a patent application. It is based on a new, positive dispensing unit, and assemblies with from two to eight outlets can be made up, and arranged for any desired combination of parallel and progressive operation. Units can be connected progressively for main lubrication points, and in parallel for secondary points.

For large installations, air or electrically operated pumps can be supplied by the company, and for smaller systems, where continuous lubrication is not required, hand pumps are provided. The amount of lubricant discharged from each unit can be adjusted as required. Timers, starters, and control and warning equipment are also available.

Research & Control Instruments, Ltd., Instrument House, 207 King's Cross Road, London, W.C.1. Stand No. 2, Row T, Grand Avenue

With the Philips manual CO_2 welding equipment shown on this stand, it is stated, metal can be deposited at rates up to 12 lb. per hour. A new version of the Philips automatic CO_2 welding equipment is also exhibited which has an adaptable welding head and a closed-circuit cooling system. One set is shown arranged for continuous production of repeat straight runs, and another is mounted on a conventional 14-ft. welding boom, for operations on pressure vessels and other cylindrical work, carried on rotators.

Philips 400 amp., type ES1489, oil-cooled transformers, are being used for welding demonstrations, and attention is also drawn to the Philips 350 amp., 175 amp., and 65 amp. transformers. The full range of Philips manual electrodes is shown, and special prominence is given to the new contact electrodes for hard surfacing, and to the Philips C16, zircon-iron powder contact electrode for use on "difficult" steels.

The latest Philips stud welding equipment may be operated on either d.c. or a.c., from any suitable source. Any diameter of screw or stud, from $\frac{1}{16}$ to $\frac{5}{8}$ in. can be accommodated, merely by changing the work holder and fitting the correct size of welding cartridge. The screws and studs need not be specially prepared.

An addition to the range of Philips "universal" coolant clarifiers is the type 7744/34 which has a capacity of 200 gal. per hour, and is particularly intended for use with small grinding machines. A transistor-operated electronic probe is employed to control the motor instead of a float switch, as fitted to the existing, larger types. The latter, in the standard range, are made in capacities up to 5,000 gal. per hour, but for special installations, notably in aluminium mills, they have been built with capacities of more than 15,000 gal. per hour.

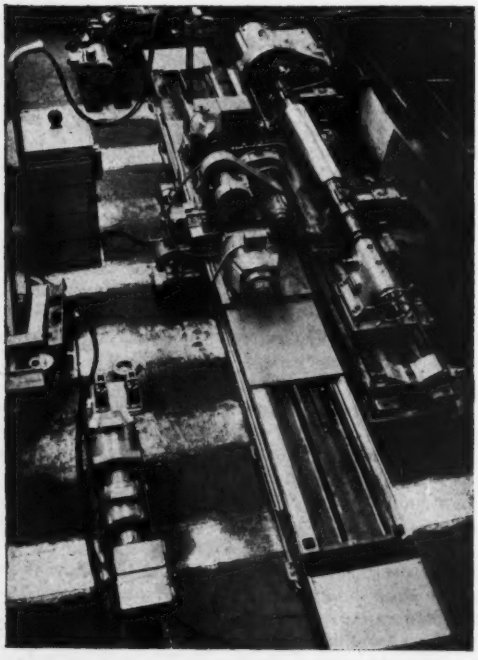
Intended for use with machines producing heavy types of ferrous swarf, or where a relatively viscous coolant is employed, the Philips Magna-Drum incorporates ceramic magnet rings alternating with steel discs, and is stated to be capable of extracting ferrous particles of sizes down to one micron. Where a combination of magnetic and mechanical filtration is necessary, the Philips Magna-Fabrix unit, which combines the functions of a Magna-Drum and a "universal" clarifier, may be used.

NEWS OF THE INDUSTRY

The South West

NEWMAN INDUSTRIES, LTD., Yate, Bristol, are experiencing a very good demand for electric motors of many sizes and types from fractional up to 600 h.p. Much interest is being shown in the range of Newman motors ranging from 0·5 to 125 h.p., with expoxy resin encapsulated stator windings. The encapsulation process is stated to afford complete protection against moisture, oil and many types of chemicals. Improved resistance to mechanical damage to windings, due to the abrading action of airborne particles, is also claimed.

The machine tool division, which was established more than 25 years ago, continues to be well occupied with a variety of rebuilding work.



Craven roll-grinding machine rebuilt by Newman Industries, Ltd., for export to New Zealand

Facilities provided enable very large machines to be accepted for rebuilding to maker's limits of accuracy, and occasionally to superior standards. Among the many interesting examples of work successfully undertaken may be mentioned the rebuilding of a Wilkins & Mitchell 1,800-ton power press and the Craven roll-grinding machine, here illustrated. The latter machine, which admits work up to 42 in. diameter by 16 ft. long, has been shipped to New Zealand. Old machines are frequently sent to the company for rebuilding and modification, and in this connection it may be noted that a Ryder 6-spindle Verticalauto, built some 20 years ago, has recently been fully restored.

The foundry modernization programme now in progress provides for a works extension of 40,000 sq. ft. and the installation of two new cupolas.

SERVIS RECORDERS, LTD., 19 London Road, Gloucester, are steadily expanding the field of application for their Servis recorders. These small, self-contained, instruments, fitted with circular charts, are designed to record movement, with reference to a time scale, extending over a period of four hours or longer, up to nine days. Each recorder is fitted with a sensitive pendulum which causes a sapphire point to indent a wax-covered revolving chart whenever the parent machine, vehicle or equipment is in motion or working. Accurate records of running time can thus be provided automatically for a wide variety of machinery in which vibration or other movement occurs, including, for example, machine tools, presses, injection moulding machines, conveyors, and fork-lift trucks.

A recent addition to the company's range is the type TM Servis recorder which is provided with a plunger-operated turret punch, coded to indicate six causes of stoppage on a machine. The operator, in the event of an interruption, selects the appropriate code on the plunger dial and punches the chart. A study may then be made of the causes of the various stoppages, with the object of preventing recurrence or reducing frequency. Recorders with electro-magnetic systems can be supplied, when required, for remote indication of motor running time, shaft rotation, or reciprocating movement on machines, also specially adapted elec-

tric recorders, arranged to show as many as 16 causes of stoppage on machines.

It is stated that wide use of Servis recorders is now being made in connection with work study and for analysing production times.

F. W. HERRIDGE.

Hull

J. H. FENNER & CO., LTD., Marfleet, Hull, report that demands for their full range of products, from customers in both the home and the export markets, continue to increase. Production has now begun, in a new extension to the works, of the range of Taper-Lock pulleys, couplings, variable speed drive units, and torque-arm shaft-mounted speed reducers. It was noted that building work has been started on a further extension, which will house the research and development departments of the company. This extension will be known as the Hainsworth Research Centre of the Fenner Group.

The Clutch Division is concentrating on the recently introduced range of Fenner-Platt dry plate clutches. As compared with the previous designs, these clutches have increased horse-power transmitting capacity and larger diameter bores. Leaflet 580/20, which gives full details of power ratings, service factors, and clutch dimensions, is now available, on request, from any Fenner branch.

MANUFACTURERS EQUIPMENT CO., LTD., Sutton Road, Hull, report that during recent months there has been a steady increase in the demand for their range of Rapistan conveyor and storage equipment. Extensions at these works, for accommodating the commercial and drawing offices, and the development department, have recently been completed.

PRIESTMAN BROTHERS, LTD., Marfleet, Hull, produce a wide range of excavators, grabs, grab dredgers, and cross roll bearing slewing rings, in conjunction with British Timken, Ltd. In the excavator field, orders for the new Lion III excavator are being booked rapidly. The bearing department is maintaining a high output of cross roll bearings which are fitted to Priestman excavators and grab dredgers. They are also used extensively in many industries for mounting heavy revolving structures.

New equipment and new production techniques are constantly being applied and in accordance with this trend, the company has recently installed the following new plant: Two Lincoln semi-automatic submerged arc welding machines; an Asquith O.D.3 radial drilling machine equipped with an E.M.I. rotary indexing table, with punched tape control for the accurate drilling of slewing rings; a Wadkin electronically-controlled table-type drilling machine; a Max Mueller automatic chucking lathe; a Hancoline electronic profile flame-cutting machine. A Wiedemann turret punch press is on order for operations on sheet metal parts.

ROSE, DOWNS & THOMPSON, LTD., Old Foundry, Hull, a member of the Davy-Ashmore Group of companies, are busy with large repeat orders and new contracts for their range of oils and fats extraction and processing machinery.

An extension to the machine shop, which is nearing completion, will house all the equipment for the production of stainless steel-clad rolls, tubes and drums. We are informed that the demand for clad rolls continues to increase as the sphere of applications is widened, and that the list of users has recently been extended to include firms in the film-processing, food manufacturing and plastics manufacturing industries.

It was noted that a Dormer drill grinding and point thinning machine, a Zwicky Christen type 2-32 drill grinder, and a Newall 1520 jig boring machine have recently been installed in the tool-room. Machine tools and equipment recently introduced in other sections of the works include a Sunderland No. 275 gear planing machine; a Kearns No. 3W.B. boring machine; a Pullmax type X8 plate edge beveller; and a Sciaky Powerspot 75 spot welding unit. In addition, a 95 kVA. continuously rated transformer and capacitor have been installed to serve six additional 350-amp. operator positions in the hardening department. Machines at present on order include a Churchill roll grinding machine with a capacity of 36 in. diameter by 240 in. long, and a set of Bronx plate bending rolls, of the pinch-pyramid type, with facilities for conical rolling, and a capacity of 10 ft. wide by 1¼ in. thick.

R. SUTCLIFFE.

Centre of Gravity Location

Prepared at the request of the Federation of Manufacturers of Construction Equipment, B.S. 3318 covers methods of locating the centres of gravity of heavy objects, and is intended to assist designers, manufacturers, and customers in reducing risks of accidents.

The methods recommended are those for which facilities are likely to be available at most factories. They are based on the use of a weighbridge; a pivoted, inclined ramp; and suspension from a suitable overhead point. A theodolite is needed for the suspension method, but the only instruments required for the other methods are a spirit level and a rule.

Copies of the publication may be obtained from the British Standards Institution, Sales Branch, 2 Park Street, London, W.1. [Price 5s., postage extra to non-subscribers.]

Industrial Notes

B. ELLIOTT & CO., LTD., Victoria Works, Victoria Road, London, N.W.10, have acquired the share capital of Broadway Equipment, Ltd., formerly of 194-6 Finchley Road, London, N.W.3.

AN AUCTION SALE OF MACHINE TOOLS and miscellaneous stores will be held at the W.D. Storage Depot, Royal Arsenal, Woolwich, London, S.E.18, on May 16-18. The auctioneers will be Fuller, Horsey, Sons & Cassell (Dept. N), 10 Lloyd's Avenue, London, E.C.3.

HEADLAND ENGINEERING DEVELOPMENTS, LTD., Melon Road, London, S.E.15, who have been appointed agents for Ultrasonic Industries Inc., New York, U.S.A., inform us that the full range of diSONtegrator ultrasonic cleaners is now available in the United Kingdom.

FAFNIR BEARING CO., LTD., Upper Villiers Street, Wolverhampton. A new factory is to be built for this company on a 20-acre site at Hednesford, Staffs. The area, initially, will be 60,000 sq. ft., and the new building will replace the company's existing Hednesford factory.

FERRANTI, LTD., Hollinwood, Lancs., have set up a Northern Computing service at their head office. Available for industrial, scientific, and commercial calculations, this service will be based, initially, on a Pegasus general-purpose digital computer.

PROGRESS (UNIVERSAL), LTD., 590-594 Wandsworth Road, London, S.W.8, have recently introduced the "Multiple" floor scrubbing and polishing machine which covers a 36-in. wide path. It is stated that it can be easily handled by one operator.

ADVANCE COMPONENTS, LTD., Roebuck Road, Hainault, Ilford, Essex, have introduced the type T.T.1 equipment for testing low and medium power transistors while still in circuit. It is stated that considerable time can thus be saved, and that risk of damage, particularly to printed circuit boards, is avoided.

THE EXPORT CREDITS GUARANTEE DEPARTMENT, 59-67 Gresham Street, London, E.C.2, has established a new section to be known as the Financial Guarantees and Policy Division, to deal with the "export finance guarantees" recently announced by the President of the Board of Trade. Mr. R. A. Dickinson will be in charge of this new Division.

MONKS & CRANE, LTD., have again made arrangements this year to stage a "machine tool fortnight" in the showroom at their head office address in Garretts Green Lane, Sheldon, Birmingham, 33. The display will start on May 8, and it is stated that a number of new Continental machine tools will be on view. Provision will be made for demonstrating almost all the machines, under power.

TRIPLEX FUNDAMENTAL RESEARCH LABORATORY, Holly Grange, Balsall Common, Warwickshire.—Recent developments include the provision of a new engineering division, to service the light-engineering companies of the Triplex group, and extensions to the heat-treatment laboratory, in which a new single-stage toughening furnace is now installed.

BARDAHL PRODUCTS, LTD., 39 Craven Road, London, W.2, have added two special-purpose greases to their range. One of these products, known as No-Melt, is intended for use at unusually high temperatures, and it is stated that it will remain on bearings up to 1,000 deg. F. The other new grease, which has a calcium-soap base, is water repellent and is claimed to be suitable for low temperature applications where excessive water is present.

SEMINARS ON MANPOWER AND SHOP LOADING SCHEDULING.—Two-day seminars on the above subject will be conducted by Mr. William Imbrie, general manager of Mauchly Associates, as follows: May 11 and 12, Waldorf Hotel, London; May 15 and 16, Midland Hotel, Birmingham; May 17 and 18, Grand Hotel, Manchester. Full particulars can be obtained from Materials Management International, Ltd., 66 Chandos Place, London, W.C.2.

THE PLESSEY CO., LTD., Ilford Essex, have concluded a licence agreement with Guldner-Motoren-Werke of Germany, whereby they will produce Hydro-Stabil equipment for sale in the United Kingdom and the British Commonwealth. This hydraulic equipment covers a power range from 3 to 120 h.p. and is suitable for hydrostatic transmissions for vehicles, and for many other purposes, including machine tools.

JAMES H. RANDALL & SON, LTD., Paddington Green Works, London, W.2, have introduced a 55- by 35¾- by 44-in. high cabinet for storing antiquarian-size drawings flat. There are 30 trays, each of which is 1 in. deep and will take 50 drawings. The trays have radiused handles and slide on non-mechanical runners. We are informed that one of these units was awarded a silver medal at the recent International Inventors Exhibition in Brussels.

THE NATIONAL INDUSTRIAL SAFETY CONFERENCE, 1961, organized by The Royal Society for the Prevention of Accidents, Industrial Safety Division, 75 Victoria Street, London, S.W.1, will be held in Scarborough from May 12 to 14. Particular importance is attached to this conference, it is stated, in view of the provisional figures issued by the Ministry of Labour, which show increases in both non-fatal and fatal factory accidents for 1960, as compared with 1959.

UNSEALED RADIOACTIVE SUBSTANCES.—Requirements for the protection of persons employed in factories and other places to which the 1937 Factories Act applies, against ionizing radiations and other hazards arising from the use of unsealed radioactive substances are laid down in a Preliminary Draft of Regulations, which has been published by the Ministry of Labour (H.M. Stationery Office. Price 1s. 3d. net). Observations on these draft regulations must be made in writing before July 31.

A CONFERENCE ON INSPECTION AND TESTING which is being organized by The Institution of Engineering Inspection and The Society of Non-Destructive Examination will be held at Oxford in September. Matters to be discussed will include the function of management in relation to inspection, the economics of inspection and non-destructive testing, and the recruitment, education, and training of inspection staffs. Full particulars can be obtained from the Oxford Conference secretariat, The Institution of Engineering Inspection, 616 Grand Buildings, Trafalgar Square, London, W.C.2.

RENAULT MACHINE TOOLS (U.K.), LTD., Shrewsbury, inform us that they recently secured an order, valued at £200,000, for the supply of Renault in-line transfer and auxiliary machines for the quantity production of Hobbs automatic transmissions for motor cars at the works of Gresham & Craven, Ltd., Worsley, Manchester. The company designs and builds unit machines incorporating electro-mechanical heads from 1½ to 15 h.p., and standard bases, tables, and columns. Works capacity at Shrewsbury, it is stated, is at present fully committed in connection with orders for in-line, rotary, and single station machines.

DALLOW LAMBERT & CO., LTD., Thurmaston, Leicester, recently supplied two of their size MG 80 " Wet Dedusters " to the Aluminium Bronze Co., Ltd., Walsall. These units are employed to handle dust from two lines of grinding and polishing machines. Because the machines are employed for operations on aluminium bronze and aluminium die castings, the dust has explosive properties. It is stated that the sludge emitted from the Dedusters has a low water content, and is acceptable to the waste product refiners. Each unit has a capacity of 8,000 cu. ft. of air per min., and is self-contained with a 30-h.p. motorized fan and drag link sludge ejector.

W. H. ALLEN SONS & CO., LTD., Queens Engineering Works, Bedford, are supplying two Allen-Stoeckicht epicyclic reduction gears for use in the main drives for tower-mounted winding equipment for the Cardowan Colliery of the Scottish Coal Board. Each unit is of the double-reduction type with two epicyclic trains. The first train is of the star type, with the planet wheel carrier held stationary, and the second, of the planetary type, with the annulus system held stationary. Reduction is from 713 to 63·1 r.p.m., and at this speed the maximum torque is equivalent to 1,320 h.p. Each gear is designed to run continuously at this power.

THE MORGAN CRUCIBLE CO., LTD., have now ceased to trade and have become a holding company. The various activities of the company have been assumed by the following five new wholly-owned subsidiaries: MORGANITE CARBON, LTD., Battersea, London, S.W.11 (carbon products and sintered bearings); MORGANITE CRUCIBLE, LTD., Norton, Worcester (crucibles, furnaces, and foundry accessories); MORGANITE ELECTROHEAT, LTD., Wandsworth, London, S.W.18 (furnace elements); and MORGANITE RESEARCH & DEVELOPMENT, LTD., and MORGANITE EXPORTS, LTD., Battersea, London, S.W.11. Other subsidiaries in the group are Morgan Refractories, Ltd., Morganite Resistors, Ltd., Ship Carbon Co. of Great Britain, Ltd., Graphite Products, Ltd., Morgan Components, Ltd., and Morgan-Mintex, Ltd.

Obituary

MR. FRED ARCHDALE.—We regret to record the death, at the age of 68, of Mr. Fred Archdale, a director of James Archdale & Co., Ltd., Worcester, one of the machine tool companies in the Staveley Group. He died while on holiday in Spain. Mr. Archdale had been actively associated with the company for 50 years.

Personal

MR. J. M. BALDOCK has joined the board of CIBA United Kingdom, Ltd., 96 Piccadilly, London, W.1.

MR. T. P. KEELEY, Yorkshire agent for Martin Bros. (Machinery), Ltd., has moved to "Skinners Hall," Hope Road, Edale, via Sheffield.

MR. H. L. SATCHELL, M.B.E., F.I.W.M., director of manufacture, Associated Electrical Industries (Rugby), Ltd., Rugby, retired recently after 41 years' service with the company.

MR. A. C. CAMPBELL-SMITH, works manager of the Rodney Works, Patchway of Bristol Siddeley, is the new president of the Bristol and West of England Engineering Manufacturers' Association.

MAJOR J. VIVIAN HOLMAN, A.F.R.Ae.S., M.I.Ae.S., F.Inst.D., director of the Adam Engineering Co., Ltd. (Haesler Sales), 4 Grange Street, St. Albans, Herts., has taken up residence at "Farthings," Spinney Lane, West Chiltington, near Pulborough, Sussex (telephone, West Chiltington 2195), to augment the services offered by the company and provide further assistance for sub-agents in connection with the sale of the range of Continental precision machine tools. Major Holman may be contacted at the above number, but all correspondence should continue to be addressed to St. Albans.

The following new appointments have been announced:—

MR. CYRIL E. HARRISON, managing director of English Sewing Cotton Co., Ltd., as president of the Federation of British Industries.

DR. T. U. MATTHEW, Ph.D., M.Sc., B.Sc., M.I.Mech.E., A.R.T.C., as director manufacturing for Massey-Ferguson (United Kingdom), Ltd., Coventry.

DR. L. R. BLAKE, Ph.D., B.Sc. (Hons.) Eng., A.M.I.E.E., as director of engineering for Brush Electrical Engineering Co., Ltd., Loughborough, with a seat on the board as an executive director.

MR. B. G. BARNES and MR. T. CUSSELLE as representatives for Thos. P. Headland, Ltd., 10 Melon Road, Peckham, London, S.E.15, in Essex and North and East London postal districts. The former will be concerned with machine tools and accessories, and the latter with gas and electric welding equipment.

MR. H. BALDWIN as representative in the Midlands area for the Press & Shear Machinery Co., Ltd., 172-178 Victoria Road, London, W.3. Mr. Baldwin, who is attached to the company's office at 1075 Kingsbury Road, Erdington, Birmingham, 24, was formerly sales manager for Bronx Engineering Co., Ltd., Press Brake Division, Lye, near Stourbridge, Worcs.

MR. JENNER R. THOMAS, formerly with The Plessey Co., Ltd., and a director of Amar Tool & Gauge Co., Ltd., as consultant engineer to the board of directors of Fletcher, Brock & Collis, Ltd., Fowler Road, Hainault, Essex. This appointment has been made in connection with a planned expansion of the companies activities in the light engineering field which include automatic work, turning, milling, press work, and heat treatment.

MR. L. W. CARRINGTON as managing director of Ex-Cell-O Group Sales, Ltd., Leicester, in succession to Mr. E. J. Townsend, who has left to start in business on his own account. Mr. Carrington joined Ex-Cell-O Corporation (Machine Tools), Ltd., seven years ago as sales manager, having previously spent many years with A. A. Jones & Shipman, Ltd., Leicester. His position as sales manager has been filled by Mr. J. A. Spokes, who also joined Ex-Cell-O from A. A. Jones & Shipman, Ltd.

Mr. L. W. Carrington

Mr. W. Parkinson.

MR. WILLIAM PARKINSON as chief engineer of Precision Gear Machines & Tools, Ltd., Red Ring Works, Bodmin Road, Coventry. Previously he was with W. E. Sykes, Ltd., as development engineer, production manager, and chief engineer (machine tools).

Mr. Parkinson has also been associated with Churchill Redman, Ltd., and later with Churchill Gear Machines, Ltd., as chief draughtsman and production engineer. Educated at Gateshead Technical College, he served an apprenticeship with Vickers Armstrongs (Engineers), Ltd., at the Scotswood Works.

Coming Events

INSTITUTION OF PLANT ENGINEERS.—*Southern Branch.* May 3, at 7.30 p.m., at the Polygon Hotel, Southampton; lecture on "Industrial Floors," by W. J. Warlow.

INSTITUTION OF PRODUCTION ENGINEERS.—*Wales Region.* A one-day conference on "The Conservation of Materials" will be held on May 5, at 9 a.m. to 4.30 p.m., at the South Wales Institute of Engineers, Park Place, Cardiff. Applications for tickets should be made to Mr. A. E. Haynes, c/o A.B. Metal Products, Ltd., Abercynon, Glamorgan.

Engineering and Marine Exhibitors

Books Received

A PRACTICAL GUIDE TO THE PROMOTION OF EXPORTS (second, revised edition). Edited by Roger Falk. The Advertising Association, 1 Bell Yard, London, W.C.2.

In his foreword, Mr. Falk states that in 1958, 30 per cent of our exports of manufactured goods were provided by 40 firms, and suggests that these figures are "alarming." He also points out that whereas the volume of United Kingdom exports of manufactures rose by 21 per cent during the fifties the corresponding figures for other countries were as follows: U.S.A., 62; France, 98; Japan, 305; Germany, 511; "all other industrial countries," 114.

The booklet includes articles on overseas market research, selling, and sales promotion; colour, pack and presentation; and industry and government in the export field. Copies of the booklet "in reasonable quantity" are obtainable from Mr. P. Crawfurth-Smith (above address).

Correction

In MACHINERY, 98/910—19/4/61, the address of Baldwin Instrument Co., Ltd., should have been given as Lowfield Street, Dartford, Kent.

Scrap Metals

†LONDON.—‡Prices per ton for non-ferrous scrap metals free from iron are as follows:—Clean copper wire, untinned and free from lead and solder, £200; clean heavy copper, untinned and free from lead and solder, £195; copper wire No. 2, £189; clean light copper, £185; braziery copper, £171; gunmetal, £179; brass, mixed, £130; lead, net, £54; zinc, £45; cast aluminium, £102; old rolled aluminium, £105; battery lead, £27; unsweated brass radiators, £105; hollow pewter, £540; black pewter, £420.

MIDLANDS.—Tin has continued to command attention and the market has strengthened further. There has been some easing during the past few days but the price remains considerably higher than it was two weeks ago. In copper there has also been a recovery which is somewhat surprising in view of the ample supplies of this metal. Merchants are readily finding outlets for most grades of copper-base scrap, and the situation in general has improved.

Copper.—All grades including brazier and No. 2 wire show price improvements of £3 to £5 per ton.

Brass.—Reflecting the better tone of copper, mixed brass has been in demand at values £2 to £3 per ton higher.

Gunmetal.—The position is strong and consumers are willing to pay slightly higher prices to obtain supplies.

Lead.—Small merchants holding stocks in the hope of a rise in prices are disappointed at the lack of market activity and consequent smallness of increase. The outlook is not very hopeful.

Aluminium.—More orders for supplies from the motor car firms are resulting in greater stability of prices for this metal. Better recent values are maintained and there is a possibility of future improvement.

Zinc.—Demand is keeping fairly steady, but there has been a slight easing in prices.

White Metals.—Buyers are interested in pewter and solder materials and are prepared to offer improved prices.

† George Cohen, Sons & Co., Ltd., 600 Wood Lane, London, W.12.
‡ Subject to market fluctuations.

The Budget

(*Continued from page* 927)

fronting many firms which have adopted, or are in process of installing, oil burning equipment on an extensive scale, and now find that operating costs have been arbitrarily raised. It was not altogether surprising, perhaps, that the Chancellor should have taken some action in view of the fact that imports of petroleum and petroleum products rose from £335·7 million in 1955 to £482·4 million in 1960 while coal production fell by 27·8 million tons, and stocks rose by 22 million tons. It is unfortunate, however, that the burden falls mainly on the more progressive companies, which have incurred substantial capital expenditure to achieve higher efficiency.

It could hardly be contended that the Budget provisions, in general, will make any appreciable contribution towards the attainment of higher productivity. At the moment, however, it appears that the rate of installation of new equipment is, in any case, being determined largely by the capacity of the machine building industries to satisfy demands. In these circumstances it is to be hoped that the new "regulators", if they must be invoked, will permit smoother and less wasteful regulation of industrial activity than the methods that have been employed in the past.

Machine Tool Share Market

Stock markets after being mainly steady, became active and cheerful as a result of the Budget proposals, and the period under review closed on a firm note.

The gilt-edged section was well supported and, on balance, higher levels were recorded for British Government and similar fixed interest stocks.

In the commercial and industrial sections a bright tendency developed, with the general trend upward as a result of sustained investment buying, and several prominent features resulted from good company news.

Among machine tool issues Edgar Allen advanced 3s. to 44s. 6d.; British Oxygen, 1s. to 35s.; Clarkson (Engineers), 7½d. to 30s.; B. Elliott, 3d. to 3s. 7½d.; Alfred Herbert, 1s. to 76s. 6d.; John Holroyd "A," 9d. to 18s. 9d.; John Holroyd "B," 1s. 6d. to 17s. 9d.; H. W. Kearns, 6d. to 23s. 9d.; B. & S. Massey, 3d. to 12s. 3d.; Newall Engineering, 3d. to 11s. 3d.; W. E. Norton (Holdings), 6d. to 8s.; Samuel Osborn, 1s. to 59s.; Stedall & Co., 1s. 3d. to 10s.; Tap & Die Corporation, 9d. to 19s.; Wadkin, Ltd., 1s. 6d. to 24s.; and Thos. W. Ward, 2s. 6d. to 80s. On the other hand, Arnott & Harrison lost 3d. at 14s. 9d.; Birmingham Small Arms, 6d. at 36s.; Brooke Tool, 6d. at 10s. 3d.; Chas. Churchill, 3d. at 9s. 7½d.; Craven Bros. (Manchester), 1s. 3d. at 10s. 6d.; John Harper, 1½d. at 8s. 4½d.; Kerry's (Gt. Britain), 6d. at 10s.; John Shaw & Sons (Wolverhampton), 4½d. at 20s. 1½d.; and Sheffield Twist Drill, 6d. at 19s.

Trade Publications

HADFIELDS, LTD., East Hecla Works, Sheffield, 9.—Well-produced brochure No. 550 listing 23 Hecla die steels for such applications as the hot forging of steel, hot pressing of brass, cold drawing, hot and cold extrusion, cold shearing and forming, and plastics moulds and die casting dies. The percentage compositions and types of heat treatments are indicated, and there are notes on choice of die steels.

FERODO, LTD., Chapel-en-le-Frith, Stockport. Publication No. 974, of 270 large pages, is concerned with "friction materials for engineering equipment." There is an illustrated introductory section in which typical friction components are shown, and attention is drawn to some representative applications on earth moving equipment. In the data book which follows, details are given of linings, clutch discs and inserts, cone clutch linings, pads, friction wheels, sintered metal and cermet facings, and drive belts. A price list is appended.

COMPANY		Denom.	Middle Price
Abwood Machine Tools, Ltd.	Ord.	1/-	1/9
Allen (Edgar) & Co., Ltd.	Ord.	£1	44/6
" "	5% Prf.	£1	13/9*
Arnott & Harrison, Ltd.	Ord.	4/-	14/9
Asquith Machine Tool Corp., Ltd.	Ord.	5/-	14/-
" " "	6% Cum. Prf.	£1	16/3
Birmingham Small Arms Co., Ltd.	Ord.	10/-	36/-
" " "	5% Cum. "A" Prf.	£1	14/-xd
" " "	6% Cum. "B" Prf.	£1	16/6xd
" " "	4% 1st Mort. Deb.	Stk.	92
British Oxygen Co., Ltd.	Ord.	5/-	35/-
" "	6% Cum. Prf.	£1	20/6
Brooke Tool Manufacturing Co., Ltd.	Ord.	5/-	10/3
Broom & Wade, Ltd.	Ord.	5/-	27/6xd
" "	6% Cum. Prf.	£1	16/6
Brown (David) Corporation, Ltd.	5½% Cum. Prf.	£1	16/-
Buck & Hickman, Ltd.	6% Cum. Prf.	£1	17/-
Butler Machine Tool Co., Ltd.	Ord.	5/-	16/10½
" " "	5% Cum. Prf.	£1	14/3
Churchill (Charles) & Co., Ltd.	Ord.	2/-	9/7½
" " "	6% Cum. Prf.	£1	25/4½‡
Clarkson (Engrs.), Ltd.	Ord.	5/-	30/-
Cohen (George), 600 Group, Ltd.	Ord.	5/-	14/-
" " "	4½% Cum. Prf.	£1	13/-
Coventry Gauge & Tool Co., Ltd.	Ord.	10/-	31/3
" " "	5% Cum. Red. Prf.	£1	16/3
Craven Bros. (Manchester), Ltd.	Ord.	5/-	10/6
Elliott (B.) & Co., Ltd.	Ord.	1/-	3/7½
" "	4½% Red. Cum. Prf.	£1	12/-
Expert Tool & Case Hardening Co., Ltd.	Ord.	2/-	2/7½
Firth Brown Tools, Ltd.	4% Cum. Prf.	£1	11/-
Greenwood & Batley, Ltd.	Ord.	10/-	26/3
Harper (John) & Co., Ltd.	Ord.	5/-	8/4½
" " "	4½% Red. Cum. Prf.	£1	12/-
Herbert (Alfred), Ltd.	Ord.	£1	76/6
Holroyd (John) & Co., Ltd.	"A" Ord.	5/-	18/9
" "	"B" Ord.	5/-	17/9
Jones (A. A.) & Shipman, Ltd.	Ord.	5/-	47/-
" " "	7% Cum. Prf.	5/-	4/9
Kearney & Trecker-C.V.A., Ltd.	5½% Red. Cum. Prf.	£1	11/-
" " "	Prefd. Ord.	£1	13/9
Kearns (H. W.) & Co., Ltd.	Ord.	5/-	23/9
Kerry's (Gt. Britain), Ltd.	Ord.	5/-	10/-
Macreadys Metal Co., Ltd.	Ord.	5/-	17/-
Martin Bros. (Machinery), Ltd.	Ord.	2/-	2/6
Massey (B. & S.), Ltd.	Ord.	5/-	12/3
Newall Engineering Co., Ltd.	Ord.	2/-	11/3
Newman Industries, Ltd.	Ord.	2/-	6/-
" "	6% Prf. Ord.	5/-	5/-
Noble & Lund, Ltd.	Ord.	2/-	5/6
Norton, W. E. (Holdings), Ltd.	Ord.	2/-	8/-
Osborn (Samuel) & Co., Ltd.	Ord.	5/-	59/-
" " "	5½% Cum. Prf.	£1	23/6
Pratt (F.) & Co., Ltd.	Ord.	5/-	16/10½
Sanderson Kayser, Ltd.	Ord.	10/-	37/6
" "	6½% Cum. Prf.	£1	17/6
Scottish Machine Tool Corporation, Ltd.	Ord.	4/-	11/3
Shardlow (Ambrose) & Co., Ltd.	Ord.	£1	55/6
Shaw (John) & Sons, Wolverhampton, Ltd.	Ord.	5/-	20/1½
Sheffield Twist Drill & Steel Co., Ltd.	Ord.	4/-	19/-
" " "	5% Cum. Prf.	£1	14/3
Stedall & Co., Ltd.	Ord.	5/-	10/-
Sykes (W. E.), Ltd.	"B" non-voting Ord.	10/-	30/7½
Tap & Die Corporation, Ltd.	Ord.	5/-	19/-
" " "	4½% Deb. 1961-1977	Stk.	82½
Wadkin, Ltd.	Ord.	10/-	24/-
Ward (Thos. W.), Ltd.	Ord.	£1	80/-
" "	5% Cum. 1st Pref.	£1	14/-
" "	5% Cum. 2nd Pref.	£1	22/-
Willson Lathes, Ltd.	Ord.	1/-	3/4½

The Middle Prices given in the list are in several cases nominal prices only and not actual dealing prices. Every effort is made to ensure accuracy, but no liability can be accepted for any error. * Sheffield price. ‡ Birmingham price.

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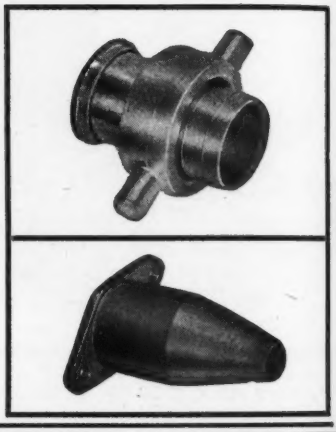

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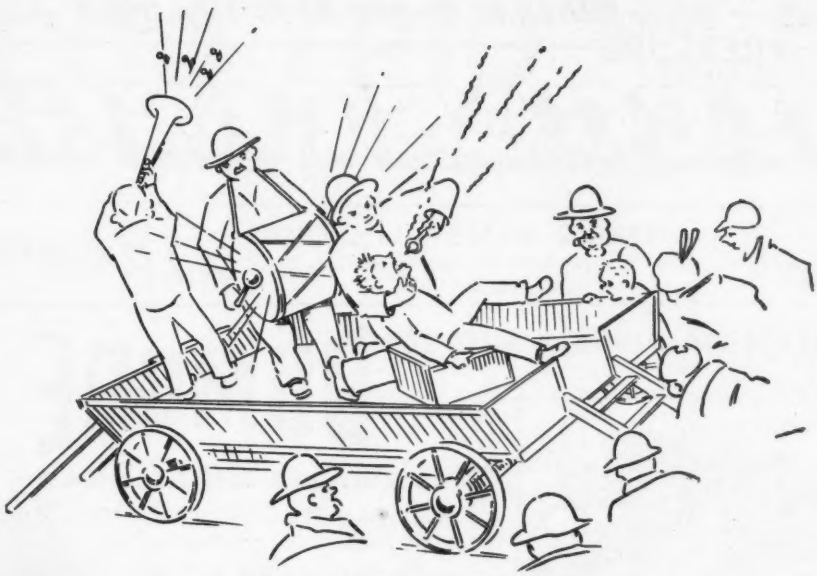

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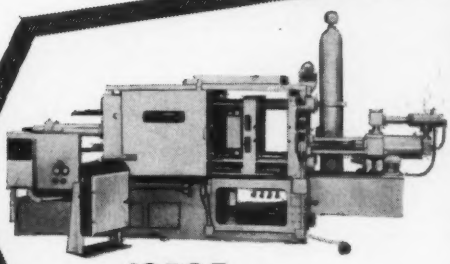

40 DC 5
Locking force: 300 tons
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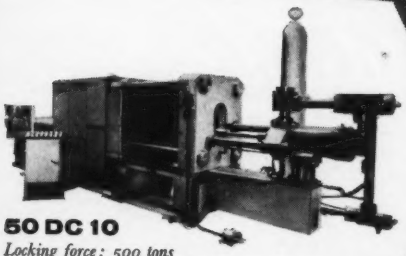

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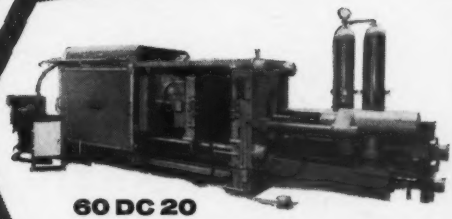

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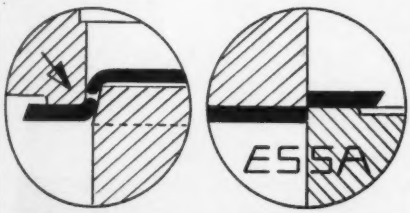

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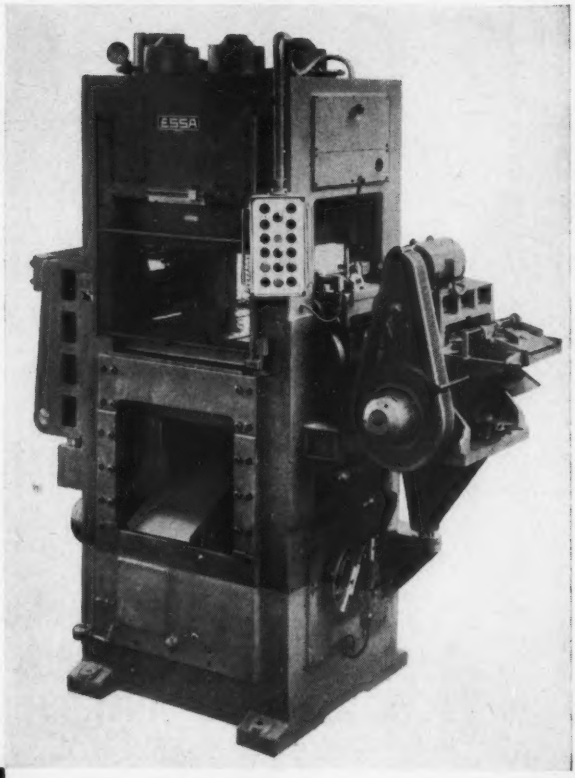

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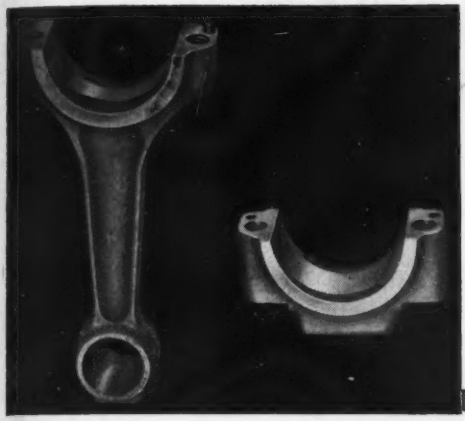

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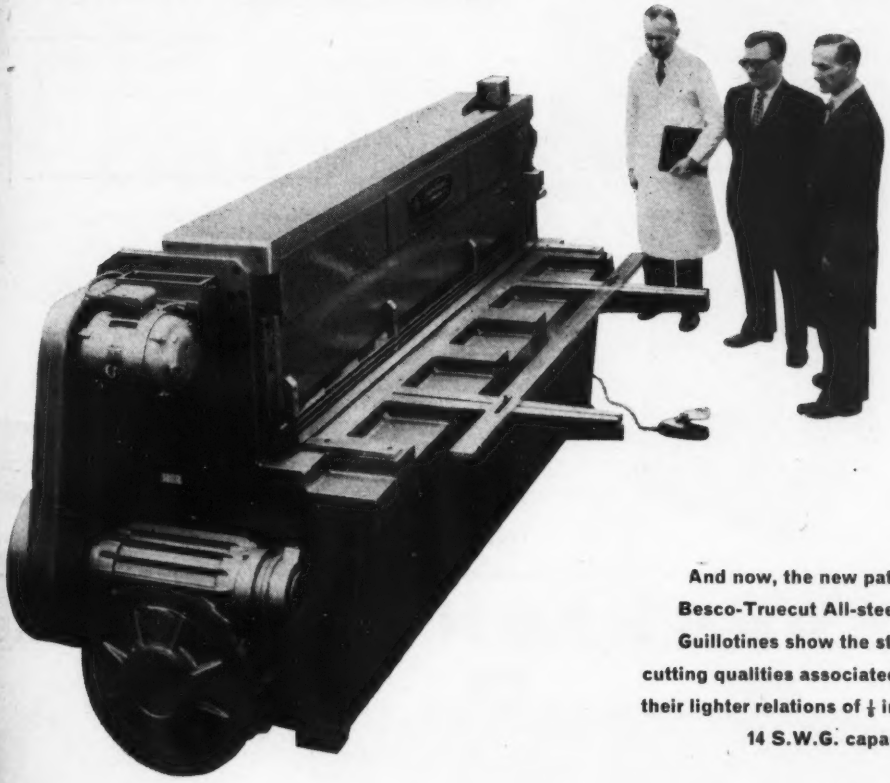

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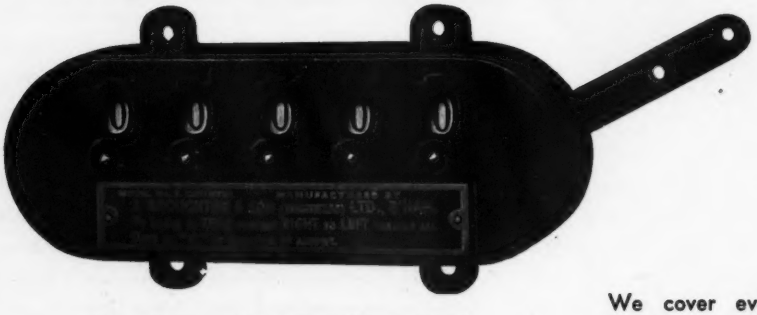

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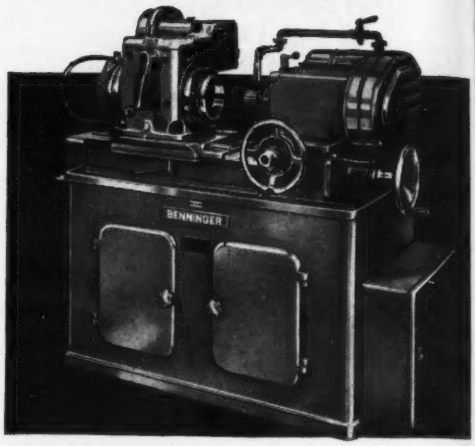

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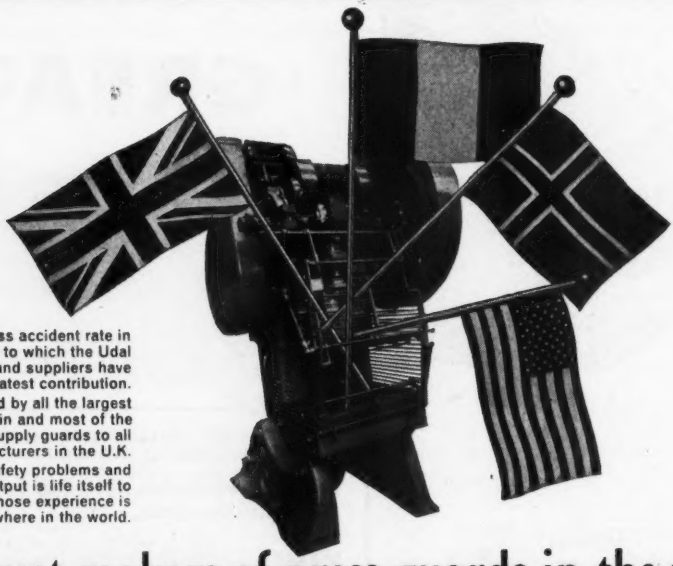

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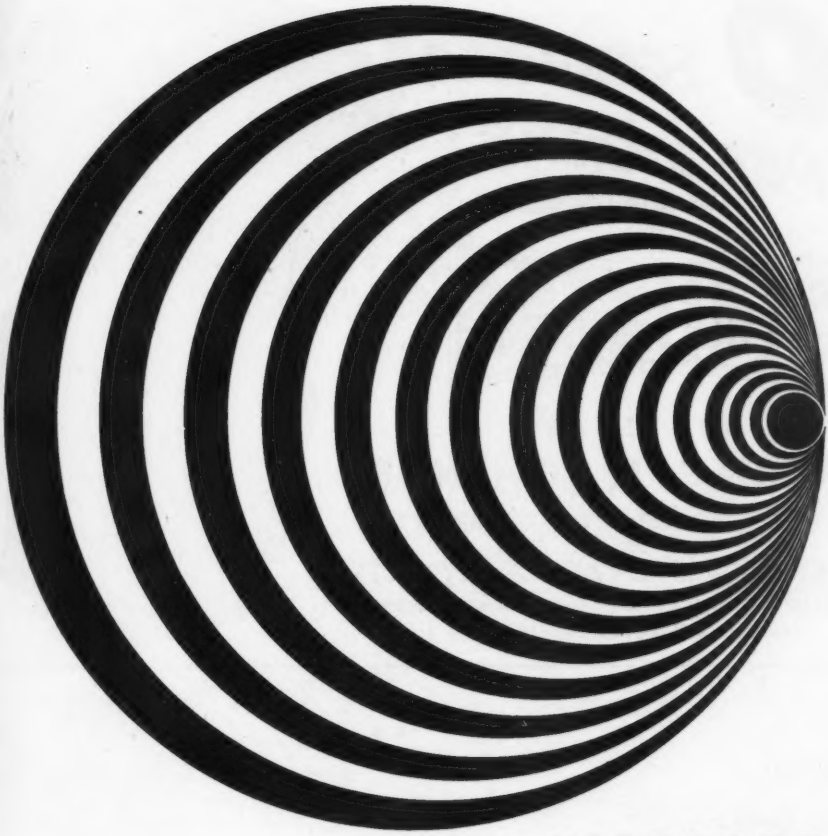

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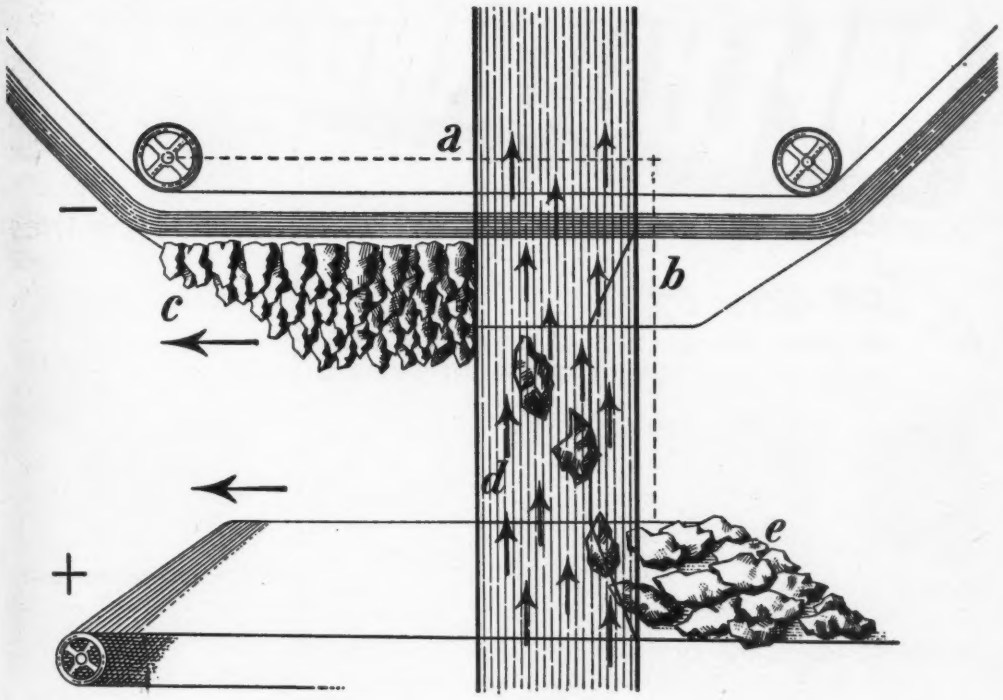

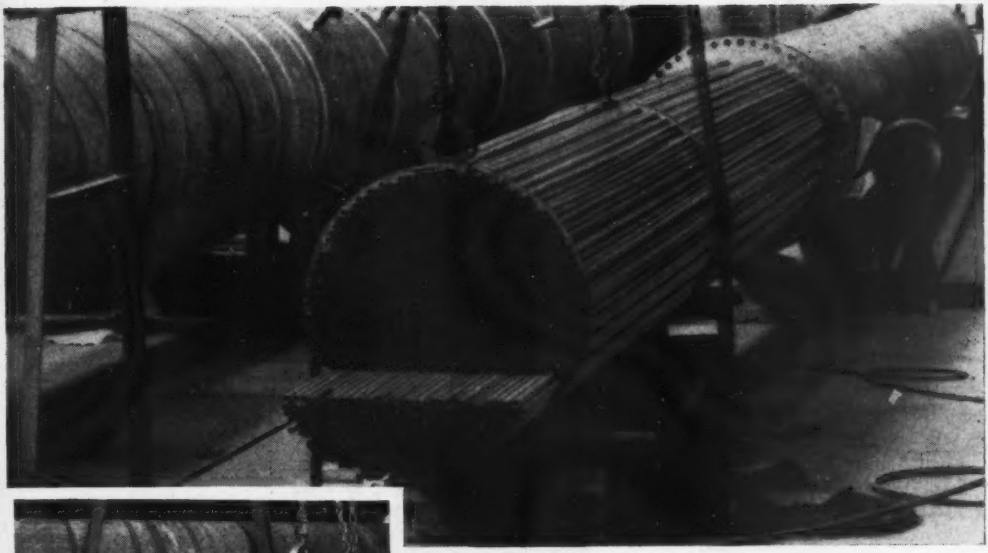

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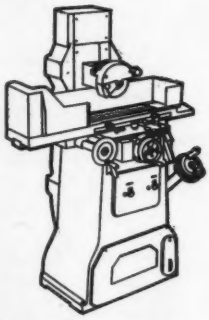

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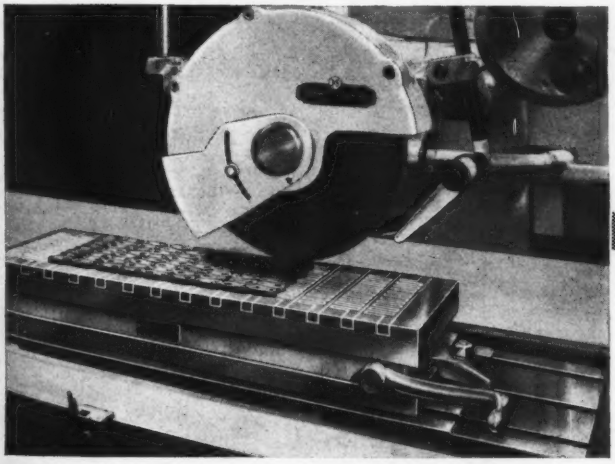

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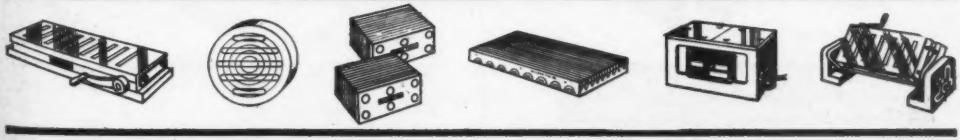

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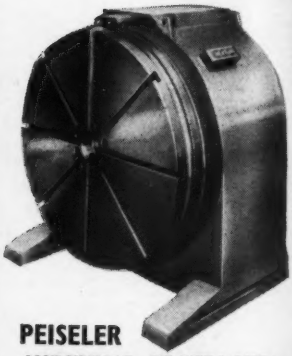

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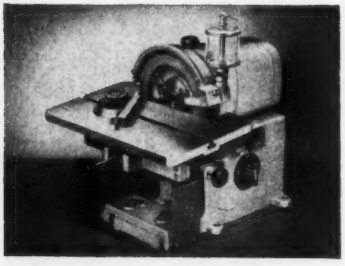

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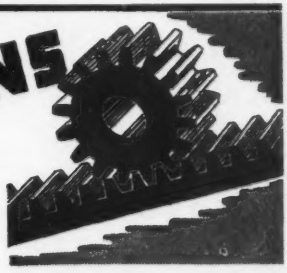
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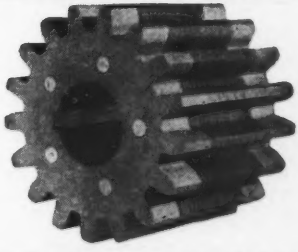
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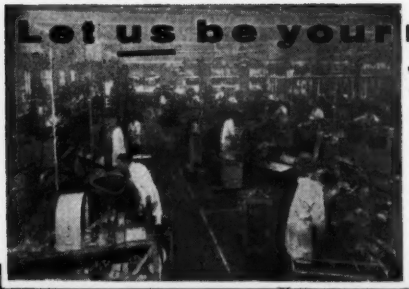

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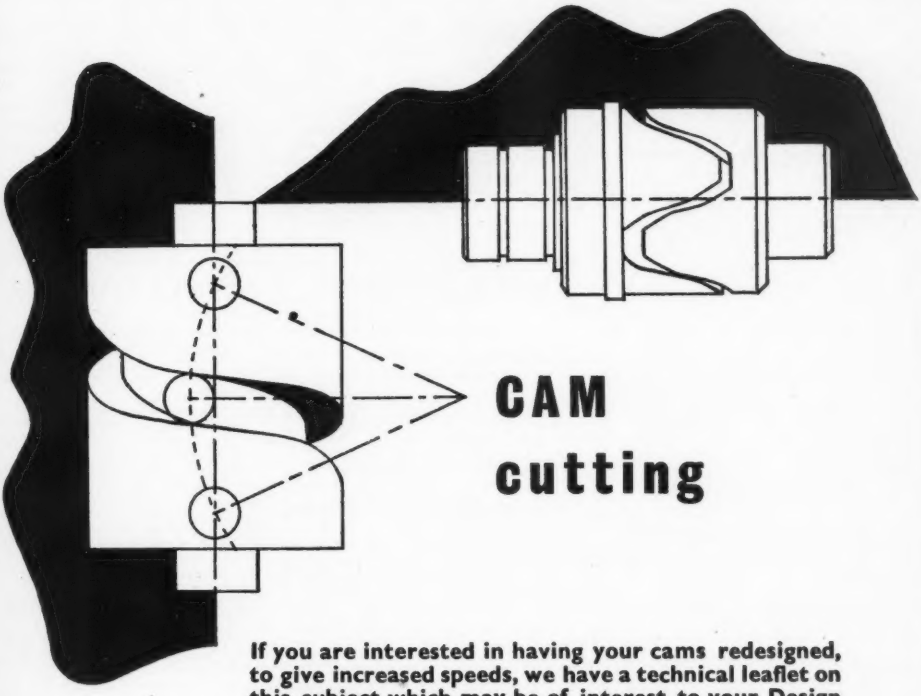

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A. LAWRENCE & CO. (MACHINE TOOLS) LTD.

will be pleased to purchase your surplus Modern Machine Tools either on a cash or part exchange basis. Ask our representative to call and inspect.

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CENTAUR TOOL WORKS, Birmingham 18, pay best prices for good modern secondhand Machine Tools by first-class makers. Write or 'phone and our representative will call.—'Phone: EDGBASTON 1118 and 1119. Grams: Capstan, Birmingham.

Wanted, Brown & Sharpe and C.V.A.8 Single Spindle Automatic.—MELBOURNE ENGINEERING CO., LTD., Melbourne, Derbyshire. 'Phone: Melbourne 232.

DOUGLAS
OF HIGH WYCOMBE

- ★ We would be pleased to purchase your Surplus Modern Machine Tools.
- ★ Generous offers made for Latest Style Machines.
- ★ Inspection Arranged at Once.
- ★ Britan Repetition Lathes a Speciality.
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A. DOUGLAS CO. LTD.
LINCOLN ROAD,
HIGH WYCOMBE,
BUCKS.
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B.G. MACHINERY, LTD., Montgomery Street, Sparkbrook, Birmingham, 11, will pay good prices for Machine Tools of first-class make and in good condition.—'Phone: VICtoria 2351/9.

WANTED!

GOOD CLASS MACHINE TOOLS
POWER PRESSES & SHEET METAL MACHINERY

EDWIN MILLEN & SONS LTD.
70 Clerkenwell Road, London E.C.1
'Phone: CLErkenwell 6064

Classified Advertisements (*PLANT WANTED, contd.*)

WANTED
TAREX
SINGLE SPINDLE
HYDRO-COPYING
AUTOMATIC
Please write giving size and full details to BOX C863, MACHINERY, Clifton House, Euston Road, N.W.1.

WANTED!
USED MACHINE TOOLS
We offer generous prices for your plant or accept in part exchange for modern equipment
E·H·JONES (MACHINE TOOLS) LTD
48, HIGH STREET, EDGWARE
Telephone: EDGware 4488
Midland 5593 - Birmingham

WE ARE KEEN BUYERS OF GOOD MODERN MACHINE TOOLS. INSPECTION WILL BE ARRANGED AT ONCE.
M. C. LAYTON LTD.
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MOUNT PLEASANT
ALPERTON, MIDDLESEX
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High Prices Paid for
GOOD QUALITY USED
CONTINENTAL Machine Tools
Box C671, MACHINERY,
Clifton House, Euston Road, N.W.1

Wanted, Good Class Machine Tools and Sheet Metal Machinery, particularly of post-war design.—H. BELL (MACHINE TOOLS), LTD., Walter Street, Leeds, 4. Tel.: 63-7398.

Italian Machine Tool Purchaser visiting England shortly requires details of all Italian and German machine tools that can be offered to him. **THIS IS URGENT.**—BOX C 854, MACHINERY, Clifton House, Euston Road, N.W.1.

8ft. × 10g. Press Brake in Good condition. Also one for rebuilding.—BOX C866, MACHINERY, Clifton House, Euston Road, N.W.1.

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WANTED
All types of modern
MACHINE TOOLS
Chipping Sodbury 3311
NEWMAN INDUSTRIES LIMITED
YATE · BRISTOL

PLANT FOR SALE

HENRY BUTCHER & CO.
Specialists in the
• SALE AND VALUATION OF FACTORIES, PLANT AND MACHINERY •
73 CHANCERY LANE, LONDON, W.C.2
TEL.: HOLBORN 8411 (8 lines) GRAMS: PENETRANCY, HOLB., LONDON

New Lathe Chucks at Bargain prices, Pratt, Taylor, etc., 3-jaw and 4-jaw, 5in. to 26in.—List from EUCO TOOLS, 44, London Road, Kingston, Surrey. 'Phone: Kin. 9029.

NORTON. 18in. x 6in. PLAIN CYLINDRICAL GRINDER, HYDRAULIC, MOTORISED 400/3/50 CENTRALISED CONTROL. BUILT IN COOLANT. EXCELLENT CONDITION. **Price £325**
BOX C765, MACHINERY,
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Hürxthal 2-spindle Vertical Milling machine,
diam. table 72in., rotatable table, diam. spindle 6in., new 1952, excellent condition, motorised, for continuous machining of workpieces of all kinds, weight 30 tons.
Dr.-Ing. Emil Lingemann, Düsseldorf, Germany, Erwin von Witzleben-Str. 1

Wickman-Ryder Optical Profile Grinder, complete with electrical equipment 440/3/50.—JOHN HARRIS TOOLS, LTD., Warwick. 'Phone 1221.

Hanson Whitney Universal Thread Miller. Capacity 4in. dia. × 9in. long. Semi Automatic. 2in. H/S Ind. motors.—WILCOX & CO., Barr Street, Birmingham, 19. NORthern 1234/5.

When answering advertisements kindly mention MACHINERY.

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RING BELLS *for machine tools*

LEEDS 63-7398

Siemens Schuckert Electrically Heated Furnace, 6ft. 10in. dia., 8ft. 10in. deep, 550 deg. C., 100 kW, 400 volts.
New Process 100 kVA Seam Welder, 400/3/50.
British Federal 50 kVA Flash Butt Welding Machine. 400/3/50.
Fielding Hydraulic Pipe Bender, up to 8in.
200 Ton Fielding Downstroke Hydraulic Press, 14in. ram, 42in. stroke, 63in. daylight.
100 Ton Fielding ditto, 10in. ram, 72in. stroke, 99in. daylight.
50 Ton Fielding ditto, 3ft. stroke.
Bliss 70 Ton Geared Double Sided Power Press. 400/3/50 supply.
3 Bliss No. 304 Vertical Single Action Drawing Presses, 7½in. stroke, 50 tons. American.
Bennie Punching, Shearing and Section Cropping Machine, 4½in. × 4½in. × ½in. angle.
Windsor 6-oz. Plastic Injection Moulding Machine.
Rushworth Guillotine, 6ft. × ½in.
Sedgewick Bending and Folding Machine, 6ft. × ½in., motorised.
"Pyramid" Bending Rolls, 9ft. 0in. × ½in.
200 Tons Tangye Hydraulic Straightening Press, bed 25ft. × 3ft., stroke 21in., motorised travelling table, 2 ram pump.
Hugh Smith Double Table Scarfing Machine, 13in. fixed stroke, from 16in. to 8ft. wide, 1½in. thick steel plates.
Crow, Harvey Punch, Shears and Angle Cropper, 18in. blade, 27in. throat, heavy duty.
Peis Punch Shears and Cropper, 12in. blade, shear ½in., takes 6in. × 6in. × ½in. angles.
Robertson Shears, ½in. capacity, 10 h.p., 28in. blade, 9in. maximum opening. (Two.)
Berry Plate Guillotine, capacity 4ft. × 1in., 18in. throat, 30 h.p. motor.
New 1-cwt. and 2-cwt. Hammers by Massey and Alldays & Onions, also 3-5-cwt. secondhand E.O.T. Cranes.
25 Ton Clyde, 21ft. 9in. span cab control. 1954. Can convert any span to 95ft.
20 Ton Vaughan, 42ft. 3in. span. Unused.
20 Ton Morris Goliath, 35ft. span, 5 ton auxiliary.
10 Ton Heywood, 34ft. span. Unused.
10 Ton Morris, 82ft. 10in. span, cab control.
10 Ton, 60ft. span. 1955. (Two.)
7 Ton, 37ft. span. 1950. (Two.)
5 Ton, 37ft. span. 1944.
3 Ton Morris, 149ft. span. 1954.

FRED WATKINS (ENGINEERING), LTD. Coleford, Glos. 'Phone: Coleford 2271 (5 lines).

NEW & USED MACHINE TOOLS AND EQUIPMENT

Now available
HORIZONTAL TAPPING MACHINES
Capacities ⅞in. ¾in. ½in.

WILKINSON
MACHINE TOOLS CO
5, VILLAGE WAY, PINNER, MIDDLESEX.
Telephone: FIELD END 6529.

Holroyd Rivet Punching Machine for sale. Motorised, toggle action, with power lift to table. Capacity ½in. diameter rivets. Gap, 5in. Table 13½in. × 8in. Electrics for 350-440/3/50.—Photo, etc., from F. J. EDWARDS LIMITED, 359, Euston Road, London, N.W.1, or 41, Water Street, Birmingham, 3.

Ward 3A Capstan Lathe Fitted 9in. 2-jaw air-operated collet chuck, turret tooling, coolant equipment, etc., power feeds to saddle and turret, good condition.—E. SMITH (MACHINE TOOLS), LTD., 76, St. Lukes Road, Birmingham, 5. Tel.: CALthorpe 3761.

Churchill HBA Internal Grinder. Capacity 4in. dia. × 2in. Hydraulic operation. Motorised.—WILCOX & CO., Barr Street, Birmingham, 19. NORthern 1234/5

American First Class Machines of all types can be supplied from our American Showrooms. Send your enquiries to K & C MACHINERY, LTD., Stephen Street, Coventry. Telephone: Coventry 23669.

Electric Motors, New and Secondhand, over 1,000 always available for sale, part exchange or hire. Prompt repairing service in event of breakdown.—JOHN RODWELL, LTD., Vicarage Road, Hornchurch. Horchhurch 48877 (3 lines).

1957 **H.M.E.** OP.40 Ungeared, variable stroke, complete with interlock guard, air balanced slide, etc. Splendid condition. Cost new £1,207.

1956 **H.M.E.** OP.30 Ungeared, fixed stroke of 4in., complete with interlock guard, air balanced slide, etc. Splendid condition. Cost new £740.

Both presses can be seen working at
IMPROVED HINGES (Warwick) LIMITED,
WEST STREET, WARWICK.
Tel. Warwick 891 (Mr. Lee).

NEW MACHINES FOR IMMEDIATE DELIVERY

MAS VRM 50A Portable Universal Radial Drill. Capacity 2in. Arm swivels through 360°.

FAVRETTO Model RTB.2000 Heavy Duty Hydraulic Surface Grinding Machine. Table 79in. by 16in. Table traverse 84in. Cross traverse of grinding head 17in.

LEINEN Model DM3SE High Speed Thread Chasing Lathe. Centre height 4in. by 12½in.

Please send for full details.

ELGAR MACHINE TOOL CO. LIMITED
172-178 VICTORIA ROAD, ACTON, LONDON, W.3.
Telephone: ACOrn 5555 (7 lines)

THE SPOT ● TO WATCH!

FOR GOOD CLASS SECONDHAND MACHINES AT LOW COST

BROWN & SHARPE 2G Auto. Ser. No. 8314, 10470 and 11545.
B.S.A. No. 48.
LIBBY 4R Capstan.
HERBERT 2S Capstan.
JONES & SHIPMAN H/Spd. Bench Drill.
FOSDICK 3 Sp. Drill.
CHURCHILL No. 1 Planetary Grinder.
BROWN & SHARPE No. 5 Plain Grinder.
SCRIVENER 1CA Centreless Grinder.
SCRIVENER No. 1 Controlled cycle Centreless Grinder.
SMART & BROWN Internal Grinder.
PRECIMAX 6in. by 12in. Plain Grinder.
JONES & SHIPMAN 10in. by 27in. Grinder. Universal.
SUPERIOR Surface Grinder.
DRUMMOND MAXICUT No. 2 Gear Shaper.
TRIUMPH Centre Lathe.
WARNER & SWASEY 2A Turret Lathe.
LEBLOND No. 15 RP Lathe.
SOUTHBEND Taper Turning Lathe. 7in. Centre.
ADCOCK & SHIPLEY 0-1 and No. 3 Hor. Mills.
VAN NORMAN Plain Mill.
VAN NORMAN No. 3 Uni. Mill.
MILWAUKEE Simplex 12/24 Mill.
CINCINNATI Model 08 Vertical Mill.
KELLER 1210 Diesinking Machine.
CINCINNATI HYDROTEL 28in. Vert. Mill.
MOREY 12M 2 Sp. Profiler.
TAYLOR & CHALLEN 1½B Press.
KITCHEN & WADE No. 2 Honing Machine.
SENTINEL 25T Power Press.
SENTINEL 12 ton Power Presses.
H.M.E. Model L.6 Power Presses (6 ton cap.).
17in. **ALBA** Shaper.
HEENAN & FROUDE Dynomometer.

LATE AMERICAN MACHINES
GLEASON 3in. Str. Bevel Gear Generators.
GLEASON 12in. Str. Bevel Gear Generators.
FELLOWS 7125 High Speed Gear Shapers.
FELLOWS 72 High Speed Gear Shaper.
FELLOWS No. 7 High Speed Gear Shaper.
FELLOWS 75A High Speed Gear Shaper.
FELLOWS 61A Gear Shaper.
HEALD 72A3 Internal Grinder.
GLEASON No. 16 Spiral Bevel Hypoid Gear Generator.
K & T 5H Plain Mill.

All machines motorised 400/3/50 unless otherwise stated.

GOOD USED MACHINE TOOLS WANTED

E. H. JONES
MACHINE TOOLS LTD.
48 HIGH STREET, EDGWARE, MIDDX.
'PHONE EDGWARE 4488/9
78 WRENTHAM STREET BIRMINGHAM 5. *Phone Midland 5583*

Classified Advertisements (*PLANT FOR SALE, contd.*)

When answering advertisements kindly mention MACHINERY.

Classified Advertisements (*PLANT FOR SALE, contd.*)

Cashmores

Selection of Machine Tools from Stock

CENTRE LATHES

MITCHELL 7in. S.S. & S.C. All-Geared Head Gap Bed Lathe, to admit 3ft. 0in. between centres.
WILLSON 7½in. S.S. & S.C. Lathe, to admit 3ft. 0in. between centres.
FAIRBAIRN 13in. S.S. & S.C. Lathe with two saddles, to admit 17ft. between centres.
LANG 8½in. S.S. & S.C. Lathe, to admit 4ft. 0in. between centres.
VOLMAN 8in. S.S. & S.C. Gap Bed Lathe, to admit 4ft. 6in. between centres.

BORING MACHINE

WEBSTER & BENNETT 48in. Vertical Boring Mill, table speeds 4-88 r.p.m.

DRILLING MACHINE

RICHMOND SR1 36in. Sensitive Radial Drilling Machine.

GRINDING MACHINES

JONES & SHIPMAN Fig. 540 Horizontal Spindle Surface Grinding Machine, hydraulic feed, 6in. × 18in. capacity.
One similar Machine with vertical spindle.
NORTON 6in. × 18in. Horizontal Spindle Surface Grinding Machine with hydraulic feed.
LUMSDEN Model 90LE Vertical Spindle Rotary Table Surface Grinding Machine, with 24in. diameter magnetic chuck.
NORTON 6in. × 30in. Hydraulic Plain Cylindrical Grinding Machine, maximum wheel diameter 20in.

MILLING MACHINES

VICTORIA M.2 Universal Milling Machine, 40in. × 10in. table.
ARCHDALE 20in. Dial Type Horizontal Milling Machine, 40in. × 12in. table.
GREENWOOD & BATLEY Plain Horizontal Milling Machine, working surface of table 20in. by 10in.
EDGWICK 18in. Horizontal Plain Production Milling Machine, with 40in. × 12in. table.
EDGWICK No. 2 Dial Type Vertical Milling Machine, 46in. × 11in. table.

PLANING MACHINE

SWIFT FUMMERSKILL 8ft. × 4ft. × 4ft. Planing Machine with 4 toolboxes, all electric Lancashire Drive.

POWER HAMMER

MASSEY 5 cwt. Pneumatic Side Type Power Hammer.

SLOTTING MACHINES

BUTLER 14in. stroke All Geared Slotting Machine with 39in. diameter rotary table.
DUTRANNOIT 24in. stroke Precision Slotting Machine with swivelling head, 39½in. table.

SHAPING MACHINES

BUTLER 12in. Heavy Duty Shaping Machine with swivelling table.
BUTLER 18in. Heavy Duty Shaping Machine.

SHEARING MACHINE

New **KEETONA** 8ft. 0in. × ¼in. Undercrank Guillotine Shearing Machine.

STRAIGHTENING ROLLS

BRONX 8ft. 0in. × ¼in. Straightening Rolls, 5 roll type.

All the above machines are motorised 400-440/3/50 cycles.

JOHN CASHMORE LTD.
NEWPORT 1, MON.
Tel.: Newport 66941 (6 lines).

NEWALL USED MACHINE DIVISION

HAVE AVAILABLE FOR EARLY DELIVERY

One NEWALL 2436 Jig Borer, fully rebuilt and carrying maker's guarantees.

One NEWALL No. 0 Jig Borer, fully rebuilt and carrying maker's guarantees.

Capacity: 18in. by 12in. Table 14in. Spindle Nose to top of table

One NEWALL 'L1' Internal Grinding Machine, 10in. by 24in. fully rebuilt and carrying maker's guarantees. Maximum Grinding Depth: 12in.

One NEWALL No. 1 Jig Borer, fully rebuilt and carrying maker's guarantees.

One NEWALL No. 2 Jig Borer, fully rebuilt and carrying maker's guarantees.

THE
NEWALL
USED MACHINE DIVISION
OUNDLE ROAD
ORTON LONGUEVILLE
PETERBOROUGH

Telephone: Peterborough 67116/7

NEW BINNS & BERRY 14½in. Centre height × 9ft. 6in. between centres, S.S. & S.C. Double Gap Bed Lathe. Swing in gap 50in. dia. × 18in. wide. Immediate delivery. Price, Ex Works, £2,381 15s.0d.

STANLEY 7in. Centre Height, admitting 38in. between centres A.G.H. S.S. & S.C. Gap Bed Lathe. Almost Unused, very well equipped. Price, £375 0s. 0d.

MILWAUKEE Model K.M. No. 3 Universal Horizontal Milling Machine. Serial No. 30-2822. Spindle speeds 15-750 r.p.m. Table size 64in. × 15in. Automatic feeds in all directions. Price £950 0s. 0d.

JONES & SHIPMAN Fig. 310 Tool and Cutter Grinding Machine.
Price £295 0s. 0d.

All machines M.D. 400/440/3/50

ERNEST SWEETMAN
(MACHINE TOOLS),
123, ROCKINGHAM STREET, SHEFFIELD, 1.
Telephone No.: 23531.

EDWIN MILLEN & SONS LTD.
70, CLERKENWELL ROAD, LONDON, E.C.1.
Tel.: CLE. 6064 & 3602.

DRILLING AND TAPPING

CORONA 4ft. Radial Drill. £325.
JONES & SHIPMAN 2in. cap. Drill. £450.
JONES & SHIPMAN 1¼in. cap. Drill. £165.
Radial Drill, 4ft. 6in., box bed. £165.
HERBERT 1 sp. Drill on three-spindle base. £165.
HAGO H.G.25 High Efficiency, ¾in. cap. £250.

GRINDERS

PALLAS No. 2 Surface, 18in. × 6in.
EXCEL Surface, 10in. × 4in. £95.
HERBERT HUNT Twist Drill Grinder. £65.
HERBERT HUNT Tap and Reamer. £65.
PFAUTER Hob Grinder.
REID No. 2 18 × 6 Surface.
BROWN & SHARPE No. 2 18 × 6 Surface.
SCRIVENER No. 1 Centreless, with auto. feed.
SMART & BROWN Internal Grinder, 1¼in. Max.
NORTON 18in. × 7in. Hyd. Cyl. Grinder. £395.

LATHES

OLDFIELD & SCHOFIELD 15in. × 60in. £650.
COLCHESTER TRIUMPH 7in. × 48in.
HERBERT SMALLPEICE, 6in. × 24in. Multi-tool.
MURAD 4in. × 24in. AGH Lathe. £125.
WARD No. 7 Capstan B/F, B/C.
C.V.A. No. 8 Automatic.
HARRISON 4½in. × 42in. G.B. Full equip.
HOGARTH 6in. × 32in. S. & S. Lathe. £125.
PITTLER Turret Lathe, 2¼in. cap. £95.
RIVET Instrument Lathe, 4½in. × 24in.
SPRINGFIELD 14in. Swing F. & B. Lathe. £225

MILLERS (Vert. and Horiz.)

CENTEC No. 3R Auto-cycle, pro mill.
CINCINNATI 2MH., 53in. × 11in.
HEY Duplex Spline Mill. £175.
ADCOCK & SHIPLEY 1VM Vert. 25in. × 7in. As new.
HARDINGE 24in. × 6in. Prec. Auto feed. £165.

POWER PRESSES AND SHEET METAL MACHINES

6ft. × 16 s.w.g. **CHICAGO** Folder. £150.
6ft. × 6 s.w.g. **EDWARDS,** high lift. £150.
6ft. × 4in. Slip Rolls. £70.
BESCO 10 ton Power Press. £175.
HUMPHREYS 10 ton Power Press. £175.
E.M.G. 9-ton Airdraulic. £200.
KENNEDY 2in. Tube Bender. £85.
FLY and Kick Presses.

MISCELLANEOUS

HOLROYD Profiling Machine. £175.
PFAUTER R.S.2 40in. dia. Hobber
THIEL Filing and Sawing Machine. £95.
HURTH Key Seating Machine. £225.
THIEL Punch Shaper.
ORMEROD 12in. Shaper with Cam Cutting Attach.
TMA Engraver with type.
AEROGRAPH Twin Cylinder comp. 100 p.s.i.
MATHEY Jig Borer with clocks. As new.
RAPIDOR 15in. × 15in. Filing and Sawing. £165.
PFAUTER 000 Gear Hobber, with gears. £150.
PHILLIPS 40 kVA Spot Welder. £165.
Other machines in stock.

WE BUY
EXCHANGES
WELCOME

WE SELL
HIRE PURCHASE
ARRANGED

Micromatic Hydrohoner
Hydraulic Honer. Model H1 Auto cycle. Table 11¼in. × 10in. W/S. Ind. Motors.—WILCOX & CO., Barr Street, Birmingham, 19. NORthern 1234/5.

Wild Barfield Type L.03B
Electric Laboratory Oven for Sale. Inside size l. to r. × f. to b. × height 17½in. × 19in. × 20in., 240/1/50 supply, 4 kW, 50 deg. to 300 deg. C. Thermostat control. Low, medium and high heats. Single front door. Four shelves.—F. J. EDWARDS, LIMITED, 359, Euston Road, London, N.W.1, or 41, Water Street, Birmingham, 3.

A Good Number of High-class Machine Tools always in stock.—M. ELLISON (SALFORD), LTD., Cook Street, off Chapel Street, Salford, 3, Lancs.

Classified Advertisements (PLANT FOR SALE, contd.)

M. WARD

(Machine Tools) Ltd.

1, KILBURN HIGH ROAD, LONDON, N.W.6

Tel.: Maida Vale 1195/6
Grams: Emwarneers, Kilb., London

LATHES

WILLSON 7½in. × 36in. Gap Bed S.S. & S.C.
LE BLOND 15RP S. & S. 15in. × 24in.
CARDIFF S.S. & S.C. 8½in. × 48in. "Senior." 1952 M/c.
CRAVEN 36in. Swing × 12ft. Between S.S. & S.C.
SMART & BROWN 4in. × 18in. S.S. & S.C.
SWIFT 12in. × 12ft. S.S. & S.C. Heavy Duty R/trav. to saddle.
LANG 36in. Surfacing and Boring.
ACME No. 5W Capstan, chuck machine.
RYDERMATIC No. 12 Multi-Tool.
D.S.G. 13Z Mincr S.S. & S.C.
WILLSON 6½in. × 36in. Gap Bed S.S. & S.C.

CAPSTANS AND AUTOS

WARD No. 7 (Curran Sub-Contract).
TAYLOR No. 1263 Capstan, ½in. cap.

DRILLS

GRIMSTON ELECTRISKA Model EB100 Bench.
CORONA Model 9FX Super High Speed Bench.
CORONA Model 12AX Bench, ⅝in. cap.
BRISDON Model 52 Pillar, ½in. cap.

GRINDERS

KEIGHLEY KN Internal.
GRAND RAPIDS No. 35 Hyd. Hor. Spin. Surface.
HERBERT JUNIOR Surface, 10in. × 6in. × 9in.
BROWN & SHARPE No. 5 Surface.
BROWN & SHARPE No. 23 Plain, cap. 10in. × 48in.
BROWN & SHARPE No. 2 Surface, cap. 6in. × 18in.
SMART & BROWN Internal, 1½in. cap.
BROWN & SHARPE No. 5, 3in. × 18in. Plain.
BALLINGER 10/24 "Versatile" Abrasive Cutting-off Machine.
TURNER T.T. 14/20 d/ended Tool.
NEWALL Model L.U. 10in. × 36in. Hyd. Universal.
B.S.A. LANDIS Type C 6in. × 18in. Hyd. Plain.
SNOW Mod. O.S.72 Surface, cap. 15in. × 72in.
CHURCHILL Mod. H.C.B. Internal Auto Size.
HAHN & KOLB Hyd. Disc Lapping M/c.
JACKMAN No. 22 Disc, 18in. dia.
LUMSDEN Mod. 12M Tool, 14in. × 2 wheel.

MILLERS—Vertical

REED PRENTICE Mod. 3VG, table 38in. × 10in.
DENBIGH No. C4. Swivel table 46in. × 10in.
CINCINNATI Model O8 Production.
KENDALL & GENT Duplex Profile, table 18in. × 15in.

MILLERS—Horizontal

BROWN & SHARPE No. 000 Plain Auto Miller.
CENTEC No. 2A with vert. attachment.
BROWN & SHARPE No. 2 Universal, light type.
ADCOCK & SHIPLEY No. 1AB Plain, table 26in. × 7in.
RICHMOND 2HS Plain, table 35in. × 9in.
ARCHDALE 20in., table 40in. × 10in.
ASQUITH H.K.1 Duplex Keyway, table 43in. × 10in.
CINCINNATI Mod. O.K. Prod., table 34in. × 12in.
ARCHDALE 14in. Plain, table 27in. × 8in.
ARCHDALE 28in. Plain, table 49in. × 13in.

BORING MACHINE

KEARNS Mod. O.C. Horizontal, 3in. dia. spindle.

SLOTTERS

RICHMOND 4in. Stroke (Unused). Two machines.

SAWING MACHINES

EHJ No. 13 Filing and Sawing.

SHAPERS

TOWN 14in.
HERBERT N.D. 20in.
ORMEROD 14in.

GEAR CUTTER

MAXICUT Gear Shaper, Mod. No. 2.

MISCELLANEOUS

HEAP 2in. Screwing Machine.

GRIDLEY Type L 5in. Auto.
LE BLOND No. 2 Deep Hole Drill.
LA POINTE HP30 Broach, 1952.
ELECTRAULIC VBH-15 ton Broach.
HARRISON 12in. 13in., 17in. Lathes. NEW.
CINCINNATI 1-18 Mill auto stop BLE.
BLANCHARD 18 Surf. Grinder.
VICTORIA U3 Monotrol Univ. Miller, 1953.
CONOMATIC 8 sp. 1¼in. Bar Auto.
BROWN & WARD ⅝in. and 1¼in. Autos.
WARD 3A Capstans.
HERBERT 4 Senior Capstan.
CLEVELAND 1 1/16in., 1¼in., 2in. and 2¼in. Autos.
MASSEY 5 cwt. Press Hammer (1942).
Four **UNION** ¾in. Pedestal Drills (New.)
VICTORIA V2 Swiv. Head Mill (1954).
BULLARD 16in. 6-sp. Mult-Au-Matic. 1943.
GLEASON 12in. Bevel Gear Gen. (1945).
FELLOWS 61A, 645A Gear Shapers.
BRYANT 16-38 Internal Grinder.
HEENAN-FROUDE Baling Press (1947).
SCHULER Vertical Dieing Press.
REDMAN 12 × 4 × 4 Planer.
HERBERT 9S Turret Lathe.
MILWAUKEE 2H, 2K, 3H, 3K Millers.
BLISS 304A 50 ton Press, 4in. stroke.
NORTON 14 × 72 Univ. Grinder.
BROWN & SHARPE No. 3 Univ. Grinder.
DEFIANCE 25A Horizontal Borer.
ARCHDALE 38in. Sens. Radial Drill.
NEWALL type L 10 × 24 Grinder (1942).
BUTLER 8in. Toolroom Slotter.
HEALD 72A Internal Grinders (3).
NORTON 12 × 36 Universal Grinder.
WARNER & SWASEY 3, 5 and 2A Turrets.
BROWN & SHARPE No. 3 Verti. Mill (1942).
FRATT-WHITNEY 12B 2-sp. Profiler (1941).
EDGWICK No. 2 Universal Miller.
BARNES No. 2 Horizontal Hones (3).
CHURCHILL No. 1 Planetary Grinder.
ORCUTT HM24 Gear Grinder (1944).
RYDER WELLMAN Horiz. Borer, 3in. sp.
GISHOLT 5 and 1L Turret Lathes (1941-43).
GRIDLEY Model R, 2¼in. cap., 4-sp. Auto.
ARCHDALE 18in. and 30in. Vert. Mill (1942)
CINCINNATI 2MH Plain Mills.
MONARCH Copying Lathe (1946).
CHURCHILL PBH 12 × 36 Univ. Grinders.

All modern fully motorised machines.

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SINGLE SPINDLE AUTOMATIC MOTORISED 400/3/50. **PRICE £375**

BOX C 764, MACHINERY,
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Edgwick Vertical Surface Broacher. Slide 60in. × 12in. Table 14in. × 14in. Motorised.—WILCOX & CO., Barr Street, Birmingham, 19. NORthern 1234/5.

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NEW H.S.S. Taper Shank Twist Drills up to 2½". Also special TAPS and Reamers at keen prices.

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New BAMKIN Tool and Cutter.

CAPSTAN AND TURRET LATHES

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FOSTER No. 2B Turret Lathe.

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HERBERT 23V Vert. Table 68in. × 17in., 48in. traverse.
REED PRENTICE No. 6 Heavy Duty Vert. Table 84in. × 20in. 72in. traverse.
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HELLER Automatic Thread Millers (4).
ASQUITH HKO Duplex Keyseater.

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V & O No. 11 Double Action. Approx. 10 tons. Roll feed. Max. draw 1in.

All machines motorised 400/3/50 unless otherwise stated.

Classified Advertisements (*PLANT FOR SALE, contd.*)

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ORMEROD 26in. Stroke Shaper, auto down feed.
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JONES & SHIPMAN "Electrotap" Vertical Tapping Machine, leadscrew control with auto cycle for depth, reverse and stop, 1½in. stroke, 200 r.p.m.

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NEW SWEDISH Precision Horizontal Boring Machines, 3in. and 3½in. travelling spindle; with facing head and screwcutting motion. (Sole British Agents.)
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GIDDINGS & LEWIS No. 0 Horizontal Boring, Milling and Drilling Machine, 3½in. traversing spindle, table 45½in. × 27½in.
RICHARDS No. 2 H.T. Hydrabore Universal Boring, Facing, Milling, Drilling and Tapping Machine, with increased bed length and column height; 3in. travelling spindle, 1955 machine.
RICHARDS HB2 Horizontal Boring, Milling, Drilling and Tapping Machine, 2⅝in. spindle, screwcutting motion.
WEBSTER & BENNETT 36in. Vertical Borer.

CAPSTAN AND TURRET LATHES

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HERBERT No. 12 Combination Turret Lathe, roller bearing spindle, covered vee bed, swing over bed 23½in., hollow spindle 6½in. dia., good equipment, chasing saddle with automatic sliding and surfacing feeds.
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HERBERT No. 7 Combination Turret Lathes, hollow spindle 2 13/16in. dia., 16in. swing, speeds 18-366 r.p.m.
LIBBY 4A Capstan Lathe, 2½in. hollow spindle, 20½in. swing, speeds 27-725.
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WARD 3A 1½in. capacity, chucking, power feeds to saddle and turret.

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WARD No. 10 covered bed, 4½in. spindle, ss.& sc., etc.
WARD No. 10B covered bed, 4½in. spindle, power rotating turret, power and rapid feeds to turret only, collet head and bar feed.

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JONES & SHIPMAN duplex slot miller, hydraulic feed.

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WADKIN high speed for light alloy, 16in. × 40in. table.

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CHURCHILL 35in. stroke hydraulic openside slideway grinder.
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ROWLAND 18in. double-ended disc grinder.
BROWN & SHARPE No. 2 Surface Grinder, 18in. × 6in.

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R. O. GRAY

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TURNER 1¼in. Capstan Lathe, with bar feed.

TWO **HERBERT** No. 2B Capstan Lathes, one with bar feed, one arranged for chucking.

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MURAD ⅜in. and 1in.
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DRILLS
HERBERT "C" Power Feed.
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PEGARD 3ft. 6in. Radial.
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CORONA 12AX, ⅞in. cap.
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LIENHARD No. 1H.
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T.T. & H. Type C., C.B. and M.A.
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SAFAG Pinion.
MAXICUT 7in. × 2in. × 6 D.P.
PETERMAN No. 1 and 2.
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HEALD 25in. Ring.
CHURCHILL OSB 8in. × 30in.
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SNOW Table, 20in.
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ABRASIVE 3B, 24in. × 8in.
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LATHES
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SUNDSTRAND No. 0 Production.
ST. ANDREA Model UFO3. Table 57 × 14.
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JONES FB1, 4ft. between centres.
WICKMAN MOULTON.

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Tel.: SHE. 4401/2

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NORTON MACHINE TOOLS

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Single Spindle
6 B.S.A. 48 ¼in.
2 B.S.A. 68 ¼in.
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4 BROWN & SHARPE OG
3 BROWN & SHARPE 2G

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4 WICKMAN 5 sp. 1⅝in.
3 B.S.A. GRIDLEY 6 sp. 1in.
2 GRIDLEY 6 sp. ⅞in.
4 B.S.A. GRIDLEY 4 sp. ⅞in.
1 CONOMATIC 6 sp. 1¼in.
1 CONOMATIC 6 sp. 1⅜in.
1 GREENLEE 6 sp. 1⅛in.

BORERS

1 PEARN RICHARDS No. 3 Horizontal
1 NEWALL No. 0 Jig Borer

CAPSTANS

1 HERBERT No. 1
1 WARD 1A
3 WARD No. 7
2 WARD No. 7 Combs.
1 WARD 10B Comb.
1 LIBBY IH5 Turret

CENTRE LATHES

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1 TAYLOR & CHALLEN 20 ton
1 TAYLOR & CHALLEN 15 ton
2 TAYLOR & CHALLEN 6 ton

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Single Spindle
10 POLLARD CORONA, High Speed

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1 ARCHDALE
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BOYES & EMMS S.S. & S.C. Lathe, centre height 16in. × 7ft. 6in.
HERBERT No. 20 Comb., spindle bore 7in., speeds 5-201.
ROLLO 6½ Centre Lathe.
HERBERT No. 9 Combination Turret Lathe.
SWIFT Hydraulic Copying Lathe, 36in. swing × 5ft. 6in. between centres, 30 h.p. drive.

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ARCHDALE 48in. Heavy Duty Automatic Horizontal Mill, speeds 38-313.
CINCINNATI 1-18 Production Miller.
KENDALL & GENT Vertical Miller, table 69in. × 19in., speeds 20-300, rapid traverses.
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SACEM Vertical Miller, table 33½in. × 10in. Speeds 90-785 r.p.m. Traverses: long. 20½in. Spindle vertical 4in.
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WETZEL B150, 5⅞in. spindle, table type, with travelling spindle, continuous automatic facing head, built-in revolving table, verniers, screw-cutting. Table 63in. by 71in.; distance spindle to outer stay 13ft. 2in.; table travel long./cross 95in./71in.; maximum distance spindle to table 97in.; 27 spindle speeds 1.5-270 r.p.m.; H.P. motor 20.

KEARNS No. 4 "Patent" type, with oversize spindle 4½in. diameter, continuous automatic facing head, covered bedways, table (main) 66in. by 42in.; maximum distance spindle nose to outer stay 93in.; H.P. motor 15.

KEARNS No. 2 "Patent" type, with travelling spindle 3in. diameter, continuous automatic facing head, facing capacity 30in.; covered bedways, table (main) 48in. by 30in.; maximum distance spindle nose to outer stay 72in.; spindle speeds 3.1-246 r.p.m.; H.P. motor 10.

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GILLY AFMF 65, 2½in. spindle, table type, MT No. 4, with continuous automatic facing head, built-in rotating table, verniers, screwcutting, table 35½in. by 28in.; distance spindle to outer stay 71in.; 18 spindle speeds 10-1,250 r.p.m.; facing capacity 19½in.; H.P. motor 7½, late type.

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B.S.A. ¾in.

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Hutto Vert. Honer.
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Newman

AUTOMATICS

BULLARD Multi-Au-Matic 7in. 8 spindle.
BULLARD Multi-Au-Matic 12in. 6 spindle.

BORING MACHINES

ROCCO Model AL55D Horizontal Boring and Facing Machine, 2½in. dia travelling spindle. (NEW.)
KEARNS No. 4 Horizontal Boring and Facing Machine, 4in. dia. travelling spindle, with extended traverse.
KEARNS No. 4 Horizontal Boring and Facing Machine, 4in. diameter travelling spindle.
WEBSTER & BENNETT Vertical Boring Machine, table 50in. diameter.
RICHARDS Type P&T Horizontal Floor Boring Machine, 3½in. travelling spindle, 28in. diameter facing head.
GIDDINGS & LEWIS No. 45 Horizontal Boring, Machine, 6in. diameter travelling spindle.

CAPSTAN AND CENTRE LATHES

CHURCHILL REDMAN Model 13 NM Heavy Duty S.S. & S.C. Gap Bed Centre Lathe, 13in. centre height × 72in. between centres. Swing in gap 50in.
MITCHELL Model DM10 S.S. & S.C. Gap Bed Centre Lathe, 10½in. centre height × 7ft. 5in. between centres. (NEW.)
OLDFIELD & SCHOFIELD Surfacing and Boring Lathe, 10½in. centre height.
WARD 7B Combination Turret Lathe.
HERBERT No. 12 Combination Turret Lathe, 6½in. diameter hollow spindle.
NILES Heavy Duty Centre Lathe, S.S. & S.C., 17in. centre height × 28ft. between centres.
U.L.R.O. Heavy Duty Centre Lathe, 16in. centre height × 30ft. between centres.

DRILLING MACHINES

HETTNER Radial Drilling Machine, 10ft. elevating arm.
TOWN 30in. Single Spindle Boring and Drilling Machine.

GEAR MACHINES

ORCUTT Model HM24 Hydraulic Internal Gear Grinder.
GLEASON 3in. Straight Bevel Gear Generator.

GRINDING MACHINES

LANDIS Plain Hydraulic Cylindrical Grinding Machine, 18in. swing × 72in. between centres.
ORCUTT Model HM24 Internal Spur Gear Grinding Machines.
CHURCHILL Plain Hydraulic Cylindrical Grinding Machine, 20in. swing × 72in. between centres.
BROWN & SHARPE Plain Cylindrical Grinding Machine, 10in. swing × 36in. between centres.

MILLING MACHINES

CINCINNATI Model 5/72 Plain Hydromatic Milling Machine, table 91in. × 22in. (1952).
CINCINNATI No. 2L Plain Horizontal Milling Machine, table 52in. × 10in.
CINCINNATI No. 1M Vertical Milling Machine.
CINCINNATI No. 4 Dial Type Horizontal Milling Machine.
GRAFFENSTADEN Model F1101 Plain Horizontal Milling Machine, table 52in. × 10in.
PRATT & WHITNEY Model BL3620 3-spindle "Keller" Die Sinking Machine.
CENTEC Model 3R Automatic Production Milling Machine, table 25in. × 16in.

PLANING MACHINES

BUTLER Double Column Planing Machine, capacity 12ft. × 6ft. × 4ft. 6in., 4 toolboxes.

MISCELLANEOUS

RUSSEL Model 26/28 Hydrofeed Cold Sawing Machine.
LANGE & GAILEN 28in. stroke Double Headed Hydraulic Shaping Machine.
TAYLOR & CHALLEN Double Sided 50-ton Geared Power Press, 10in. stroke.

NEWMAN INDUSTRIES LIMITED,

Machine Tool Division: YATE, BRISTOL

Tel.: Chipping Sodbury 3311. Telex. 44121.
Cables: "Dynamo Yate."
London Office: Terminal House, Grosvenor Gardens, S.W.1. Tel.: Sloane 8206.
Telex 23289.

JER

LATHES

MITCHELL 8½in. × 4ft. 4in. 1955 Machine. Taper Turning. £575.
HERBERT N.D. 8in. × 2ft. 6in., excellent condition. £175.
DENHAM 8½in. × 6ft. Well equipped. £450.
LANG 8½in. Toolroom. Excellent condition—on application.
HOLBROOK 8½in. Toolroom. Excellent condition—on application.
Cone driven Lathe, 9in., to admit 19ft. Between—on application.

CAPSTANS

WARD 3A, Bar feed, Ball Chuck—on application.
GISHOLT 1L. £325.
HERBERT No. 4 Chucking. Old but in really good condition. £150.

MILLING

BIERNATZKI VERTICAL H.4, 6ft. 1½in. × 18in. Excellent. £350.
KEMPSMITH 2G UNIVERSAL, 45in. × 10in. £475.
EDGWICK No. 2, 46in. × 11in. £375.

DRILLING

ARCHDALE 2 Motor type. Low Base, 3ft. 6in. £650.
RABOMA 2 Motor type. Low Base, 5ft. 6in. £750.
ASQUITH OD1 2 Motor type. £1,050.
ASQUITH Box Bed, Fast and Loose Pulley Drive. £195.

GRINDERS

ABWOOD VERTICAL SPINDLE SURFACE-Type TH2AP. As New. £250.
SNOW P.24, 32in. × 8in. Hydraulic. £450.
JONES & SHIPMAN UNIVERSAL TOOL and CUTTER. £275.
FRITZ WERNER 2½ RAPID TOOL and CUTTER. Fully equipped—on application.

SHAPERS

ALBA 24in. Fully Motorised. £350.
KELLY 24in. Heavy Duty. Excellent condition—on application.

PLANERS

The following coming into stock in fourteen days, all self-contained motorised, prices on application:
REDMAN 8ft. × 3ft. × 3ft.
REDMAN 8ft. × 4ft. 6in. × 4ft. 6in.
REDMAN 6ft. × 3ft. × 3ft.
SUMMERSKILL 6ft. × 2ft. 6in. × 2ft. 6in.

BORERS

WEBSTER & BENNETT 36in. Rapid traverses—on application.

PRESSES

BOXFORD 5 ton, Motorised. New—on application.

GEAR CUTTERS

BARBER & COLMAN No. 12. Fully Motorised. £185.
FELLOWS 6A 24in. capacity. Motorised—on application.

SLOTTERS

WILKINSON 10in. Cone Drive. Power to Circular Table. Good secondhand. £175.

J. E. RAISTRICK LTD.,

RELIANCE WORKS,
POYLE TRADING ESTATE,
COLNBROOK, SLOUGH, BUCKS.

Tel.: Colnbrook 2421.

Brown & Sharpe Omniversal No. 0 Toolroom Milling Machine, in AS NEW condition. Today's new price around £6,000; will accept £2,000.—BOX C728, MACHINERY, Clifton House, Euston Road, N.W.1.

No. 2 Wickman Horstman Thread Grinding Machine. Form relieving. Fully motorised.—BOX C738, MACHINERY, Clifton House, Euston Road, N.W.1.

NEW MACHINE TOOLS FROM STOCK

GRANOR OF HALIFAX 28in. stroke Heavy Duty Shaping Machine. 400-440/3/50.

EARLY DELIVERY

MITCHELL OF KEIGHLEY 8½in. Type DM8 Gap Bed Lathe, by 5ft. 3in. B.C. 400-440/3/50. Instant delivery.
MITCHELL OF KEIGHLEY 10½in. Type DM10 Gap Bed Lathe by 5ft. 5in. between centres. 400-440/3/50. Instant delivery.
MITCHELL OF KEIGHLEY 12½in. Type DM12 Gap Bed Lathe by 6ft. 9in. B.C. 400-440/3/50. April delivery.
VICTORIA No. 2 Rapidmil Universal Milling Machine, table size 48in. × 11¼in. 400-440/3/50. Instant delivery.
VICTORIA No. V2 Vertical Milling Machine. Table size 45in. × 11in. 400-440/3/50. Instant delivery.

CENTAUR TOOL WORKS,
EYRE STREET, SPRING HILL, BIRMINGHAM, 18
Tel.: EDGbaston 1118 & 1119. 'Grams: Capstan, Birmingham

TATE

ROLL GRINDING MACHINES

CRAVEN Heavy Duty Roll Grinding Machine with capacity for rolls 42in. diameter by 12ft. between centres and fitted with automatic cambering. Will take rolls up to 25 tons weight. Fully motorised machine of modern design. Weight 25 tons.

WALDRICH-SEIGEN Model WS 28 Roll Grinding Machine. 36in. Swing by 13ft. between centres with automatic cambering mechanism, etc.

New Address
TATE MACHINE TOOL CO. LTD.
348-354 KENSINGTON HIGH STREET
LONDON, W.14
WEStern 7031 (5 lines)

28in. Stroke Rockford Hydraulic Shaper. Universal table 19in. × 15in. 24in. cross slide movement and 15in. vertical movement to table. Seen London area.—BOX C985, MACHINERY, Clifton House, Euston Road, N.W.1.

Keyseater by Carter & Wright. Dual feed model. Table 32in. × 12in. 26in. longitudinal movement of spindle. 1½ h.p. spindle head traverse motor. 1½ h.p. spindle motor. 400/3/50.—BOX C968, MACHINERY, Clifton House, Euston Road, N.W.1.

Archdale Snout Borer, Modern machine. Spindle dia. 5in. Table area 65in. × 19in. 7.5 h.p. Spindle nose 50 Int. taper. Rapid power approx. to work. Auto change-over to feed and run. Fast return electrically controlled.—BOX C770, MACHINERY, Clifton House, Euston Road, N.W.1.

Butler 8in. Slotter, Capacity 8in. stroke, 20in. dia. table, electrics 400/3/50. Excellent condition.—BOX C846, MACHINERY, Clifton House, Euston Road, N.W.1.

MISCELLANEOUS FOR SALE

Induction Heaters, for Brazing, heat treatment, etc., 1 kW rating. £150.—NU-GUN TELETUBES, LTD., 3, The Mews, Duckett Road, London, N.4. MOU. 2903.

YOUR ADVERTISEMENT RECEIVED ON WEDNESDAY WILL APPEAR NEXT WEDNESDAY

AUCTIONS

By direction of Messrs. EFFICIENCY ENGINEERS, LTD., Coventry, who are changing their process of manufacture.

SALE OF
ENGINEERING MACHINE TOOLS AND EQUIPMENT
including: Automatic Lathes, Herbert Capstan Lathes, S.S. and S.C. Lathes, Horizontal and Vertical Milling Machines, Cincinnati Centreless Grinder, Thread Roller, Small Tools and Equipment.

AT THE WORKS,
SYDNALL ROAD, LONGFORD, COVENTRY.

On **WEDNESDAY, 3rd MAY, 1961,** commencing 11.30 a.m.

ON VIEW Tuesday, 2nd May, and Morning of Sale.

Catalogues (in course of preparation) from:

A. R. COLLINS SON & HARVEY
Chartered Auctioneers and Estate Agents, 1, Newhall Street, Birmingham 3. CENtral 8175-6-7.

By Order of the E R Secretary of State for War

Messrs.
FULLER HORSEY
Sons & Cassell

have been instructed to offer for SALE BY AUCTION in Lots at the **ROYAL ARSENAL, WOOLWICH, LONDON, S.E.18,** on **TUESDAY, 16th MAY, 1961,** and following days at 10.30 a.m. precisely each day.

ENGINEERS' MACHINE TOOLS INDUSTRIAL EQUIPMENT AND SURPLUS STORES

including Pratt & Whitney DEEP HOLE DRILLING MACHINE; INTERNAL, SURFACE, CYLINDRICAL and ROTARY GRINDERS; S.S. & S.C., CAPSTAN and other LATHES; MILLING MACHINES; HORIZONTAL BORING MACHINE; PLANING MACHINES; RADIAL DRILLING MACHINES; Howard INTERIM SOIL STABILISING TRAIN; Onions SOIL SCRAPER, "Euclid" ARTICULATED SCRAPER, Ahlmann SWING SHOVEL; 3 portable rubber belt ELEVATORS; Barber Greene "Junior" LAYER AND FINISHER; Diesel and Petrol ROAD ROLLERS; 5½ tons ROAD ROLLER SPARES; Double Bucket Swing WEIGHT BATCHER; Pegson POWER RAMMERS; PILE DRIVING EQUIPMENT; Aluminium built TWIN SCREW MOTOR TUG; Diesel and Petrol MOBILE CRANES; ARC and SPOT WELDERS; Diesel and Petrol GENERATING SETS; Petrol Electric Charging Sets; Coventry Climax Petrol FORK LIFT TRUCKS; 390 Nife Batteries, 40 tons HARDWOOD and SOFTWOOD BATTENS and QUARTERING; 27½ tons GROOVED SOFTWOOD BOARDS; 7½ tons PLYWOOD SHEETS; 678 UNIVERSAL CARRIER KITS; 1,500 TOOL KITS; 4,400 pairs BINOCULARS; 47 HIGH POWER MONOCULAR MICROSCOPES; 1,100 PRISMATIC COMPASSES; 4,950 POCKET WATCHES; 750 STOP WATCHES; 1,100 FREQUENCY METERS with CALIBRATION CHARTS; Scrap Radar and Wireless Equipment; RADIO and ELECTRICAL STORES; Electric Cable, Scrap Batteries; miscellaneous SERVICE CLOTHING; Blankets, Kit Bags, Furniture, Scrap Rubber Outer Covers and Inner Tubes; large quantity of MEDICAL and DENTAL EQUIPMENT, and numerous other effects.

Catalogues, 1s. each, admitting two persons on view days (Tuesday, Wednesday, Thursday, Friday and Monday preceding Sale) and one on Sale Days, may be had, when ready, from the AUCTIONEERS' OFFICES, Dept. X, 10 Lloyd's Avenue, London, E.C.3.

FOR "CLASSIFIED" ADVERTISEMENT RATES PLEASE SEE PAGE 147. SERIES RATES ON REQUEST.

SITUATIONS VACANT

If you do not wish your reply to any Box No. advertisement in this section to be forwarded to certain firms, please advise us. Your reply will then be destroyed, but you will not be notified as this would disclose the identity of the advertiser.

Sales Engineers, Age 30-40, required for London offices of established Importers of high-class Continental Machine Tools. Extensive machine tool technical and sales experience with exceptional energy and initiative are essential, knowledge of French would be an advantage. The positions offered are permanent and have excellent promotion prospects. They entail considerable travel in U.K. (driving licence essential) and abroad, remuneration is commensurate with experience and results achieved. Apply in confidence, stating box number on reply, giving age, experience, previous positions held in chronological order, salary required.—BOX C841, MACHINERY, Clifton House, Euston Road, N.W.1.

Service Engineer with Considerable experience in installation of high class Machine Tools immediately required by London company. Following tuition by manufacturers abroad work will entail extensive travelling in U.K. Apply in confidence, stating box number on reply, giving age, whether driving licence is held, experience, previous positions held in chronological order, salary required.—BOX C834, MACHINERY, Clifton House, Euston Road, N.W.1.

Technical Sales Manager for Midlands area required by Machine Tool Company having branch office and showrooms. Experience in similar position preferred.—Send details in confidence to PERSONNEL MANAGER, BOX C839, MACHINERY, Clifton House, Euston Road, N.W.1.

Highly Paid, Secure and Interesting posts are always available for technically trained men. Find out how you can put some letters after your name by preparing at home on "No Pass—No Fee" terms. A.M.I.Mech.E., A.M.I.Prod.E., A.M.S.E., City and Guilds, etc. Full details of exams. and hundreds of courses in all branches of Engineering, Draughtsmanship, Management and Automation Techniques, the benefits of our Employment Dept., and unique record of 95 per cent. successes are given in "Engineering Opportunities"—a valuable 148-page Guide which will reveal many chances you are now missing.—Write for your copy today (stating subject of interest).—FREE and without obligation, B.I.E.T. (Dept. 43a), 29, Wright's Lane, London, W.8.

Working Foreman For Small expanding Precision Engineers in N.W. London. The successful applicant would be responsible for some 20 skilled machinists engaged on short batch Aircraft Instrument work to fine tolerances. Experience should include Capstan Setting and Grinding in addition to centre lathe work, milling and drilling. Future prospects are bright for a really live practical man, able to control labour. We also require fully skilled capstan setter operators, centre lathe turners and millers.—Full details to BOX C830, MACHINERY, Clifton House, Euston Road, N.W.1.

Technical Correspondent Required to deal with correspondence, price lists, quotations, etc., in connection with sales of high-class Continental Machine Tools. Machine tool and some commercial experience is essential and knowledge of French would be an advantage. The position offered is permanent and progressive to a young engineer with suitable qualifications, energy and initiative. Apply in confidence, stating box number on reply, giving age, experience, previous positions held in chronological order, salary required.—BOX C829, MACHINERY, Clifton House, Euston Road, N.W.1.

SENIOR SALES ENGINEER

required to represent in

NORTH OF ENGLAND

MANUFACTURER & IMPORTER OF HIGH CLASS MACHINE TOOLS

Applicants should be between 30 and 40 years and have had good experience in sales of machine tools.

Write, in confidence, giving fullest information to Box C873, MACHINERY, Clifton House Euston Rd., N.W.1

ENGINEERING TECHNICAL WRITERS

Interesting posts available in London for men with sound knowledge of one or more branches of engineering and experience of technical writing.

Full details to:

BOX C855, MACHINERY, Clifton House, Euston Road, N.W.1

SALES ENGINEER wanted to sell locally near new, 200 to 2000 ton capacity U.S. stamping and forging presses.

Furnish detailed experience record. Will interview locally in May.

Wender Presses Inc., 1957D, Clay Ave., Detroit II, Mich. U.S.A.

Cable address: Wenderpres.

MECHANICAL DESIGNER

between 28-35 in the N.W.10 area

for work on rotary transfer machines and equipment for the trade. Applicant must be experienced and keen to develop new ideas which may lead to a position of Chief Designer in a new branch of an existing company. State full details of experience, positions held and present salary.

Box C.851, MACHINERY, Clifton House, Euston Road, N.W.1

CANADA

Montreal Company immediately requires several top-notch **Automatic Screw Machine Setters** for B & S Machines. Interviews London.

Write:

BOX C856, MACHINERY Clifton House, Euston Road, N.W.1

ASSISTANT TO METALLURGIST.

Assistant to Metallurgist Required for large Engineering Works in the Midlands to control in-coming raw materials —Heat Treatment—and investigation of prototype and service problems. The Department is one offering a wide variety of work. Qualifications must be Graduate or L.I.M. standard, and salary will be dependent upon qualifications and experience. Excellent Canteen facilities, Sports Ground, and Pension Scheme (after probationary period).

Apply to the PERSONNEL MANAGER, AVELING-BARFORD, LTD., Grantham.

Buying Assistant, Aged 18-21, required for progressing orders. Must be energetic and assertive. Kings Cross area. State age, experience and salary required.—BOX C875, MACHINERY, Clifton House, Euston Road, N.W.1.

Indian Company Requires Works Manager with initiative and ability, age 30/35, preferably single, to take charge of machine tool rebuilding. First class machine shop experience essential. Excellent prospects, permanent position. Principal visiting London shortly for interviews.—BOX C858, MACHINERY, Clifton House, Euston Road, N.W.1.

General Manager Wanted for light Engineering works, North London, to control office and production on Automatics and Capstans. Must have held similar position. Apply in strict confidence giving age, qualifications, experience, and salary required.—BOX C864, MACHINERY, Clifton House, Euston Road, N.W.1.

Young Man, 21-30 Age Group, preferably with some knowledge of Engineering and Grinding technique for London Office of large company manufacturing wide range of abrasive products. Excellent position with prospects.—Write stating age, education and experience (if any).—BOX C872, MACHINERY, Clifton House, Euston Road, N.W.1.

Classified Advertisements (*SITUATIONS VACANT, contd.*)

REPRESENTATIVE

TECHNICAL REPRESENTATIVE

wanted for Sheet Metal Machines and Machine Tools

N.W. London and Home Counties area. Good prospects for successful applicant. Non-contributory Pension and Assurance Scheme. Details of experience and salary required to:

Managing Director,
F. J. EDWARDS LTD.,
359, Euston Road,
London, N.W.1

Can You Sell Small Tools? The LONDON TOOL (SMALL TOOLS) CO., LTD., need (*a*) experienced representative; (*b*) young beginner.—Write stating age and experience to SALES DIRECTOR, at Fulwood House, Fulwood Place, W.C.1.

SITUATIONS WANTED

Production and Process Planning Engineer, 36, apprenticeship served and of H.N.C. Twelve years experience in the installation of Production Planning systems and the effective working of a factory through process planning. Experienced in Automatics, Automatic Cam Design, Magazine and Attachment Design. South Wales area preferred. Salary £1,000-£1,200.—BOX C833, MACHINERY, Clifton House, Euston Road, N.W.1.

Turner. With Wide Experience Production, Small Batch, Tools. Would like to contact small firm with a view to working on a payment by result basis. Advertiser situated N.W. London.—BOX C865, Clifton House, Euston Road, N.W.1.

Executive/Engineer, Age 32, H.N.C Experienced in general administration of office and works in a small Electro/Mechanical concern. Desires change to progressive small/medium concern where ability to work hard and generally assist expansion will be appreciated. Area: N. London/S. Herts.—BOX C870, MACHINERY, Clifton House, Euston Road, N.W.1.

Works Manager. Production Manager. Practical man with extensive toolroom background, press shop, machine shop, costing, budgetry, etc. Seeks interesting position. All replies answered.—BOX C871, MACHINERY, Clifton House, Euston Road, N.W.1.

Cam-Designer (B & S Type Automatics) seeks part-time work. Layouts, estimates, cam marked direct. Fully experienced Automatic Engineer.—Write BOX C874, MACHINERY, Clifton House, Euston Road, N.W.1.

PLANT REGISTER SERVICE

Machinery and Other Capital Equipment recorded initially to reconcile with latest balance sheet figures, thence monthly or quarterly visits to maintain records.—JOHN CORNISH, 77, Gresham Street, London, E.C.2. 'Phone: MONarch 4846.

REPRESENTATIVES

Advertiser Seeks Representative post in South and West area for Machine Tools and Ancillary equipment. Fully trained Engineer. Age 47. Car owner.—BOX C809, MACHINERY, Clifton House, Euston Road, N.W.1.

Young Man, 25, Grammar School seeks position as representative, service engineer, technical liaison, etc. Formerly foreman, light alloy and electrical engineering. At present in inspection. Clean licence. W. Riding Yorkshire preferred.—BOX C862, MACHINERY, Clifton House, Euston Road, N.W.1.

Tool Room Manager, Age 51, seeks position Technical Sales Representative, S.W. region. Excellent personal contacts in light engineering.—BOX C857, MACHINERY, Clifton House, Euston Road, N.W.1.

RECEIVED TOO LATE FOR CLASSIFICATION

PLANT WANTED

Albert Edwards
(MACHINERY) LTD.,
79/89 PENTONVILLE ROAD, LONDON, N.1.
Telephone: TERminus 0167/8/9

We are buyers of good modern machine tools

WANTED
DOUBLE HOUSING PLANING MACHINE. Table 33ft. by 4½ft. Light between houses 5½ft. maximum. Light from working table to top rail 3ft. 4ins. Please send photograph and details to—
LACMOTS LIMITED, SHEERNESS HARBOUR ESTATE, SHEERNESS, KENT

Wanted. 1¾in. 5-spindle Wickman Bar Machine.—BOX C674, MACHINERY, Clifton House, Euston Road, N.W.1.

Wanted. Mandrel Support Steady for Archdale 28in. × 30in. Horizontal Mill (Vee Shaped will do).—BOX C760, MACHINERY, Clifton House, Euston Road, N.W.1.

Wanted, One Dead Length Collet Chuck to suit a 2D Herbert Capstan.—BOX C869, MACHINERY, Clifton House, Euston Road, N.W.1.

MISCELLANEOUS WANTED

AC/DC Electric Motors, Generators, transformers, disused stock of cable. Power houses bought and dismantled.—MRS. JOHN HYAMS & SON, 127, Lambs Lane, Rainham, Essex. 'Phone: Rainham 5024.

TENDERS

The Office of the India Supply Mission, 2536, Massachusetts Avenue N.W., Washington 8 D.C. United States of America, invites tenders for the following:

TENDER ENQUIRY NO. SE.369.

"For the supply of one Turret Lathe and Accessories required by the Indian Bureau of Mines, Nagpur."

Specification, etc., relative to the above enquiry can be obtained from the Co-ordination Branch, India Store Department, Government Building, Bromyard Avenue, Acton, W.3, at a cost of 14 shillings and 4 pence per tender. *The cost of the tender document is not refundable, and the forms are not transferable.* Tenders are to be returned direct to India Supply Mission, at the above address, and *not to this office*, so as to reach them by 11th May, 1961.

Specimen copy of the above enquiry can be seen at India Store Department, Engineering Branch, Bromyard Avenue, Acton, W.3, under the following reference number, S4238/60/NSC/ENG.2.

BUSINESS FOR SALE

Plastic Mould and Diecast Die Toolmakers. Freehold premises nearly 3,000 sq. ft. for sale as going concern; 12 toolmakers.—Full order book (Surrey). Principals only.—BOX C877, MACHINERY, Clifton House, Euston Road, N.W.1.

AGENCIES WANTED

The London Tool (Small Tools) Co., Ltd., screw threading specialists for 40 years, are prepared to accept agency for any tools, instruments or equipment ancillary to this field.—Write to SALES DIRECTOR, at Fulwood House, Fulwood Place, High Holborn, W.C.1.

INDEX TO ADVERTISERS

(Continued on page 180)

INDEX TO ADVERTISERS—*(continued from page 179)*

When answering advertisements kindly mention MACHINERY.

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